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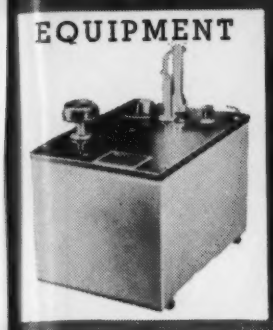

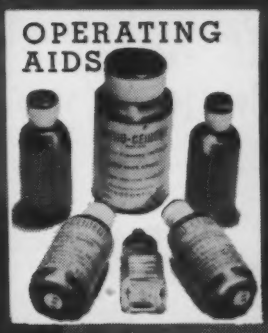

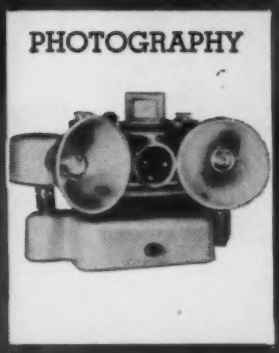

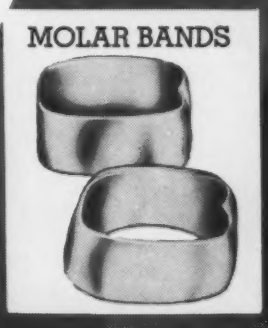

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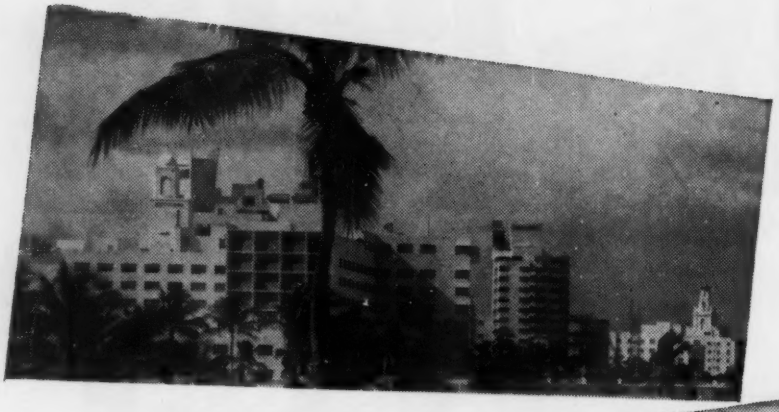

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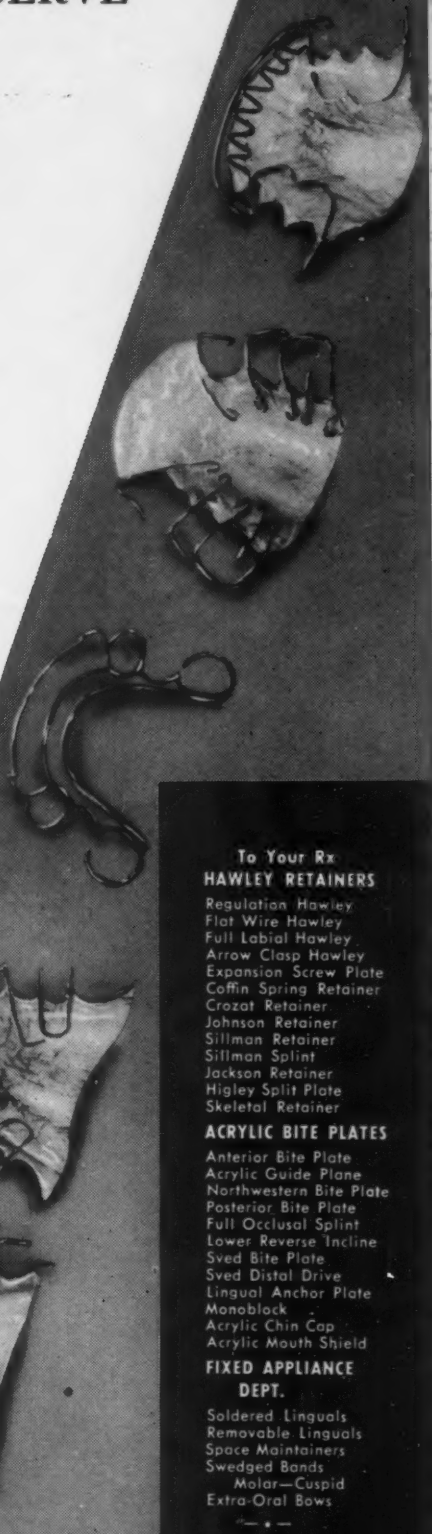

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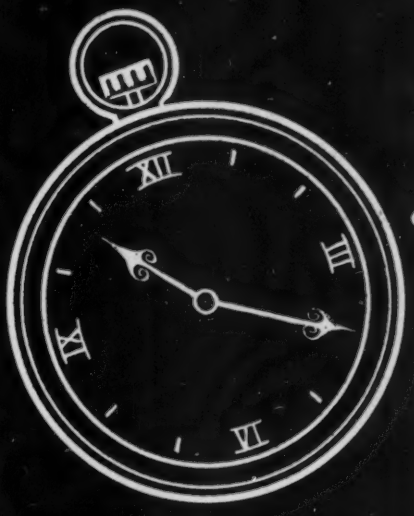

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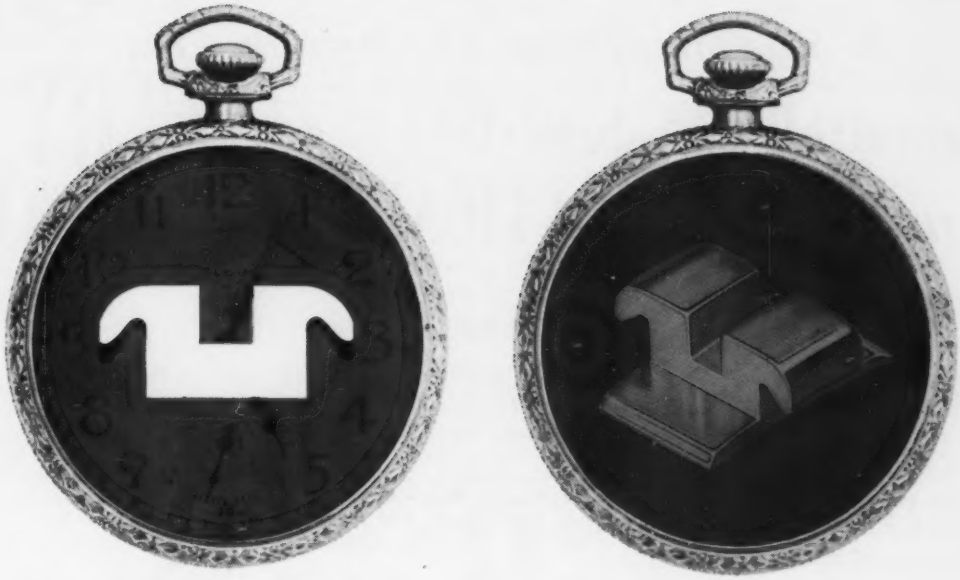

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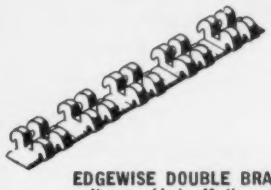

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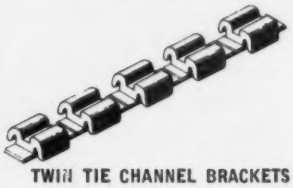

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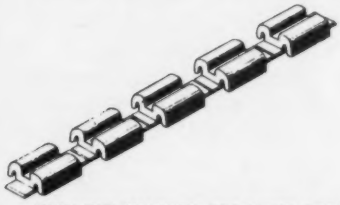

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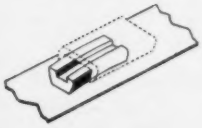

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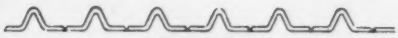

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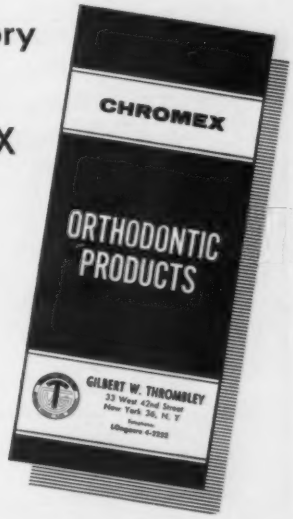

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INTRODUCTION

EXTRAORAL anchorage for moving maxillary teeth backward, devised by Kingsley[10] in 1866, was extensively used until the early 1900's. Although Case[7] still advocated it in 1908 and 1921, the profession had largely replaced it with the intermaxillary reciprocal anchorage required by Angle's[1, 2] new philosophy. However, some effects of intermaxillary anchorage were so undesirable that the late Dr. Oppenheim[12, 13] found it necessary in his practice to revive the headcap.

This study of mechanical principles in extraoral anchorage began in a discussion of headcaps with Dr. Oppenheim.[13] In 1944 he had reported a case designated "Gould, Case 1" (Figs. 2, 3, and 4), treated by me, wherein he said that this appliance had so efficiently moved the maxillary first molars that at the end of treatment the molars had not been tipped distally, as might be expected, but were upright. However, later evidence from a study of both right and left upper molars in the models (Fig. 4, *B*) now indicates that at the end of treatment the molars, instead of being upright, had a mesial axial inclination which is an even more desirable result.

The purpose of this article is twofold: (1) to fulfill a promise to Dr. Oppenheim that a final report of "Gould, Case 1" would be published and (2) to present in brief form the mechanical principles associated with extraoral anchorage.

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FINAL REPORT OF "GOULD, CASE 1"

The records of "Gould, Case 1" are submitted herewith (Figs. 2, 3, and 4). This patient had a forward shift into Class II relationship of all her upper

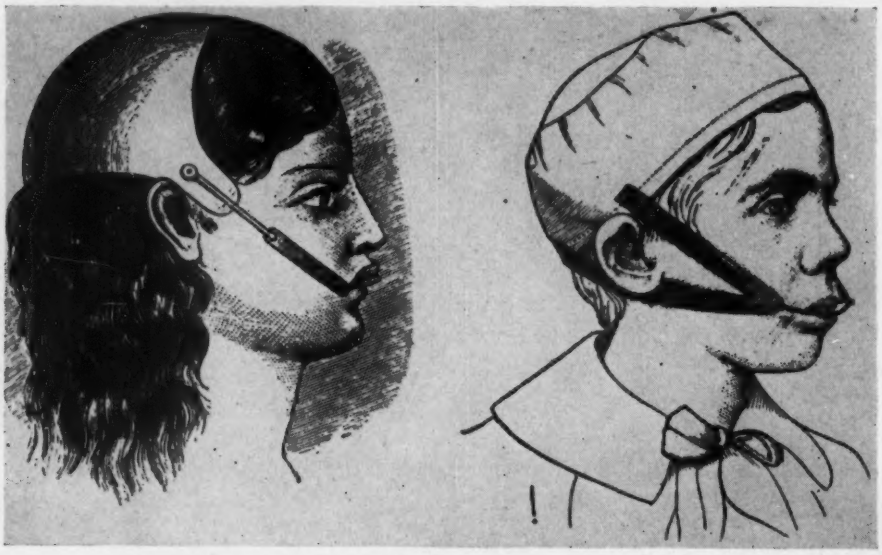
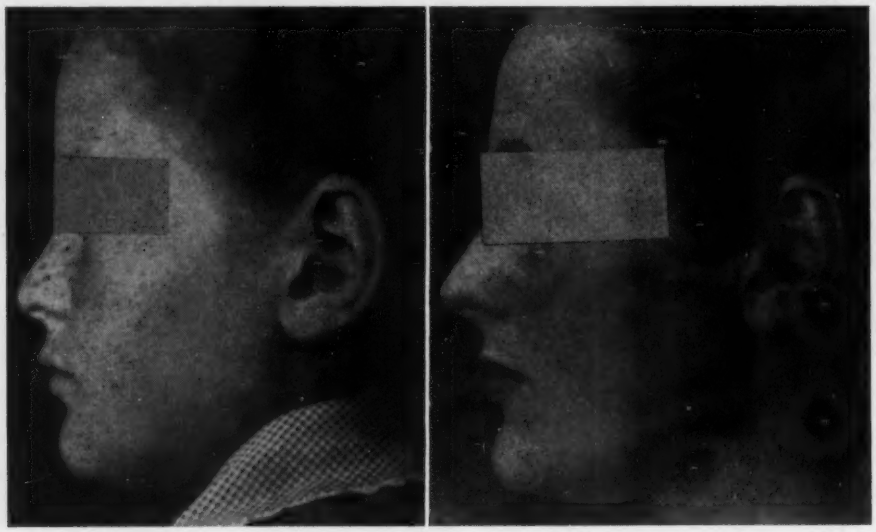


Fig. 1.—Early uses of extraoral anchorage for backward movement of upper teeth as devised by Kingsley in 1866 (*A*) and by Angle in 1899 (*B*). (From Weinberger, B. W.: Orthodontics—An Historical Review of Its Origin and Evolution, Vol. II, St. Louis, 1926, The C. V. Mosby Company.)

teeth except the central incisors and the right lateral incisor. Her malocclusion could be defined as Class I with mesial drift of the upper buccal segments. This displacement left little room for the upper right canine and the upper left



A. *B.*

Fig. 2.—"Gould, Case 1." Profile photographs. *A*, At start of treatment. *B*, Thirteen years later.

lateral incisor to take their proper places in the arch. Because the mandible and lower dental arch were in such good position, it was thought advisable not to use intermaxillary anchorage.

The upper first molars were banded to carry buccal tubes (Fig. 5, *A*) and the rest of the mechanism consisted of a traction arch, traction bar, headcap, and

A. *B.* *C.*

Fig. 3.—"Gould, Case 1." Intraoral photographs. *A*, Nov. 9, 1939, at start of treatment. *B*, Nov. 1, 1943, at end of treatment. *C*, Dec. 27, 1952, after nine years without retention.

A.

B.

Fig. 4.—"Gould, Case 1." Models in occlusion. *A*, Oct. 20, 1939, at start of treatment. *B*, Dec. 27, 1952, after nine years with no retainers.

extraoral rubber bands. As the molars moved backward, spaces opened distal to the first and second premolars; to close these spaces and keep them closed, an upper vulcanite plate was inserted with very small finger springs pressing against the mesial surfaces of the premolars. Fig. 2, *A* shows the facial profile

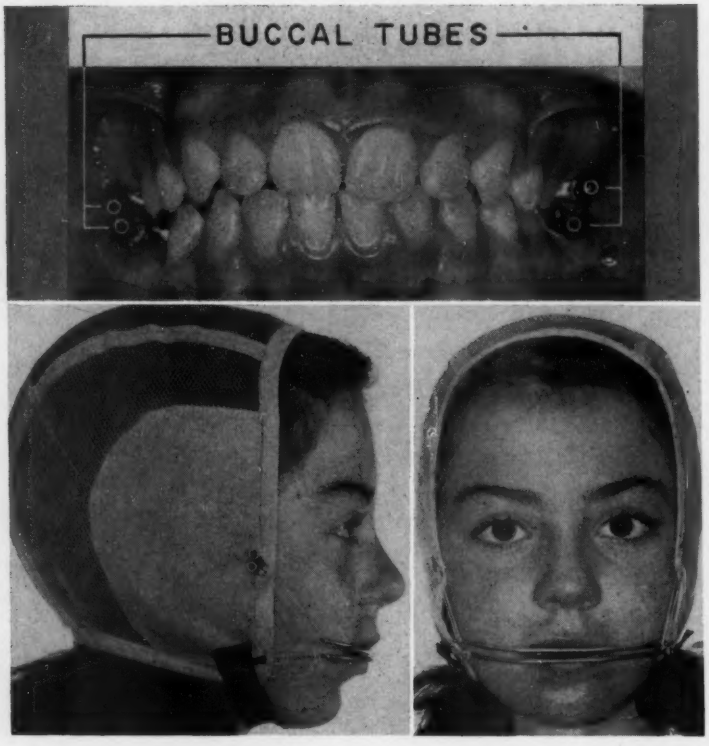
and Fig. 3, *A* gives an intraoral picture of the occlusion at the beginning of treatment. The various views of the casts at that time are shown in Fig. 4, *A*.

The occlusion after four years of active treatment is shown in Figs. 3, *B* and 4, *B*. The upper right canine and left lateral incisor had moved into correct positions spontaneously. The headcap was then discontinued and a plate retainer was made, but the patient wore it so casually for only a very short time that evidently a retainer was scarcely needed. Nine years later the patient's profile was as shown in Fig. 2, *B* and the occlusion was as shown in Fig. 3, *C*.

MECHANICAL PRINCIPLES

My present equipment for distal movement of either upper or lower molars, or both simultaneously, with control at the same time of tipping factors, consists of a nylon net headcap or helmet to which hooks are fastened (Fig. 5).

A.



B.

Fig. 5.—Equipment of extraoral anchorage. *A*, Buccal tubes for Fig. 5, *B*. *B*, Helmet and yokes for simultaneous distal movement of upper and lower teeth.

This headcap permits the anchorage hooks to be raised or lowered during treatment to produce mesial or distal tipping of the first molars and an upward or downward force on these teeth as explained later. This adjustment is an essential part of the method.

A passive traction arch or Y bar* (Fig. 6, *a*), shaped to the outer contour of the dental arch, is fitted into buccal tubes on the first permanent molars or deciduous second molars. Its shank protrudes between the lips, and into a closed

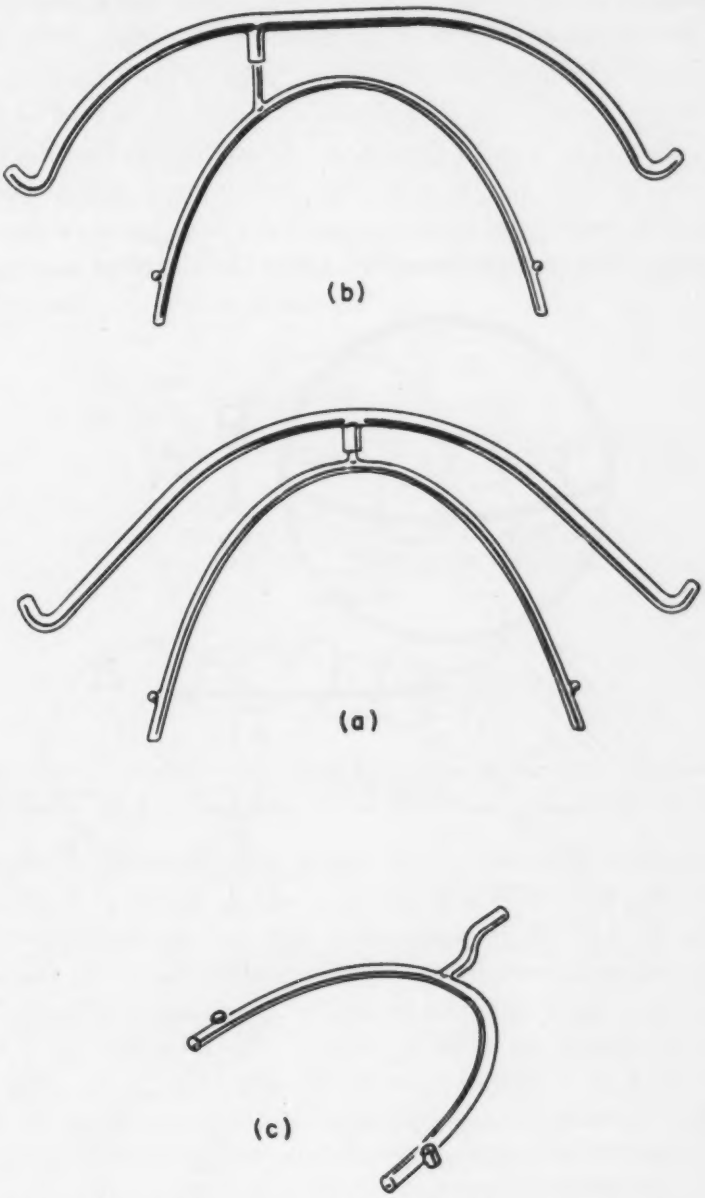


Fig. 6.—Y bar and yoke for upper arch (*a*, bilateral assembly; *b*, unilateral assembly), and for lower arch (*c*, Y bar with S-shaped shank).

tube on the yoke.* Unilateral movement is produced by offsetting the shank to the desired side (Fig. 6, *b*). When a Y bar is used for lower molars, it is

*As used by various authors, the terms *Y bar, traction arch, arch wire, dental bow,* and *inner bow* refer to an arch-shaped wire inside the mouth; while *yoke, traction bar, face-bow, occipital bow, outer bow,* and *bridle* are the external or facial parts.

aligned to clear the occlusion of the upper teeth, and its shank is given an "S" shape forward, up, and through between the lips (Fig. 6, *c*). Rubber bands to the yoke from the hooks on the helmet supply the necessary forces. When the treatment is started for the upper arch, these hooks are placed at the tragus of the ear; for the lower arch, they are placed at the angle of the mandible.

So that any extraneous pressure on the yoke as the patient sleeps will not tend to move the teeth in an undesirable direction, it is very important that the yoke be allowed to turn on the shank. In any upward or downward direction, however, the yoke should have very little play and bind quickly on the shank to control mesiodistal tipping. Also, the traction arch should be made of wire at least 0.050 inch in diameter to resist inadvertent misshaping.

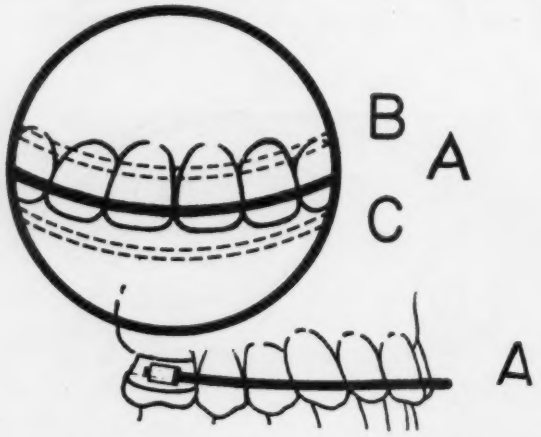


Fig. 7.—Relation of Y bar to incisors. Upper Y bar at start of treatment (*A*) should be between incisal and middle third of upper central incisors. If it deviates markedly from this, as at *B* or *C*, the helmet hooks should be relocated, but the Y bar should not be rebent.

At the start of treatment for an upper arch, the Y bar is aligned to pass in front of a line between the incisal and middle thirds of the upper central incisors (Fig. 7, *A*). If, in time, the Y bar goes markedly up (Fig. 7, *B*), indicating that the molar crowns are tipping mesially too much, the helmet hooks are lowered; when the Y bar goes below the incisal edges (Fig. 7, *C*), showing too much distal tipping, the hooks are raised. The Y bar position is thus kept as near as possible to the original incisor relationship (Fig. 7, *A*). The Y bar itself should not be rebent for this adjustment. The helmet hooks for the lower Y bar are likewise relocated higher or lower during treatment as the altered position of the shank makes this necessary.

Empirically, we know that these procedures give predictable results in movement of teeth toward desired positions. But what are the principles of mechanics which govern this treatment of malocclusion by devices pulling from outside the mouth?

Let us examine in elementary fashion the mechanics of motion of a rigid body. In general, a rigid body under the action of a force or of a set of forces

will experience two independent motions: a *translation* in the line of direction of the resultant forces, plus a *rotation** the direction of which depends upon the application points of the applied forces.

Let us consider first a body constrained to revolve about a fixed axis† or fulcrum, such as a flywheel on a shaft (Fig. 8). Since the axis is fixed, such a body can only turn, and has no translational displacement. To determine whether the rotation will be clockwise or counterclockwise, we must project the action line of the applied force beyond a point where a perpendicular (*P*) may be drawn to it from the axis. This perpendicular must turn as pushed by the applied force. Thus, in Fig. 8, *a* the perpendicular (and hence the flywheel) will go counterclockwise, while in Fig. 8, *c* the circling will be clockwise. In the special case of the line of action intersecting the axis as in Fig. 8, *b*, there will be no perpendicular and no turning.

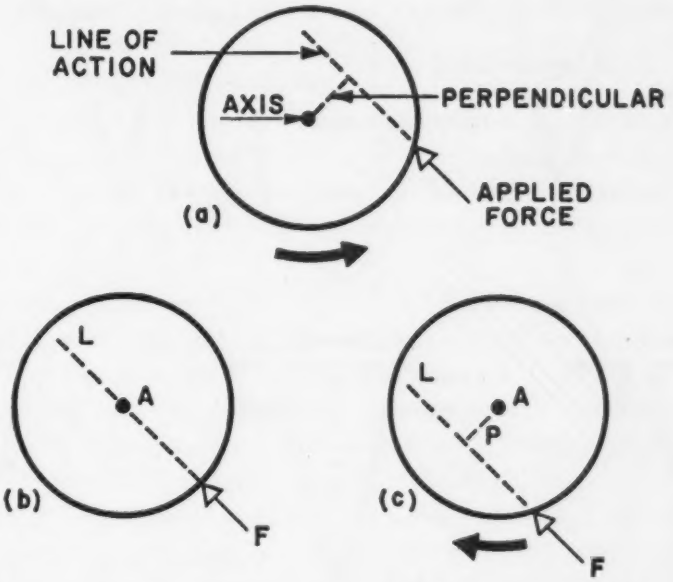


Fig. 8.—Body with fixed axis of rotation. *a*, Counterclockwise rotation; *b*, no rotation; *c*, clockwise rotation.

Let us consider next a rigid body partially embedded in a highly viscous medium, with no fixed point of support or axis of rotation.† As suggested by Case,[7] a stake in the ground (Fig. 9), which can be slowly pulled or pushed, is a good example. Unlike the flywheel with a fastened center, the axis or fulcrum of the embedded stake can move slowly as the applied and resistant forces change their relations to the stake. In Fig. 9, *a* the applied force has a translational component downward, tending to push the stake into the ground, and a horizontal component, tending to move it to the right, while in Fig. 9, *e*, the translational

*The word *rotation* as used in this article refers to a motion corresponding to the mesiodistal tipping movement of a tooth. It is not to be confused with the orthodontic "rotation" of a tooth around its long axis.

†The terms *axis* or *center of rotation* and *fulcrum* will be used synonymously in this article, and should not be interpreted as meaning the *long* axis of a tooth. This "fulcrum" is really a transverse axis at right angles to the long axis. It is sometimes called the *tilt axis* or *tilting axis*.

movement is upward and to the right, as diagramed by the straight arrows. In each instance, there will be some effective axis (Fig. 9, *A*). The position of this axis will depend on applied forces and on reaction forces, and in time will change. However, for illustrative purposes, one can safely assume that it lies somewhere within the stake as indicated in the figure. In accordance with the principle seen in fixed flywheels regarding the relation of the perpendicular (*P*) from the axis to the action line of the applied force, it is clear that in Fig. 9, *a* the rotation will be counterclockwise, while in Fig. 9, *c*, *d*, and *e* the rotation will be clockwise as indicated by the curved arrows. Because the line of action

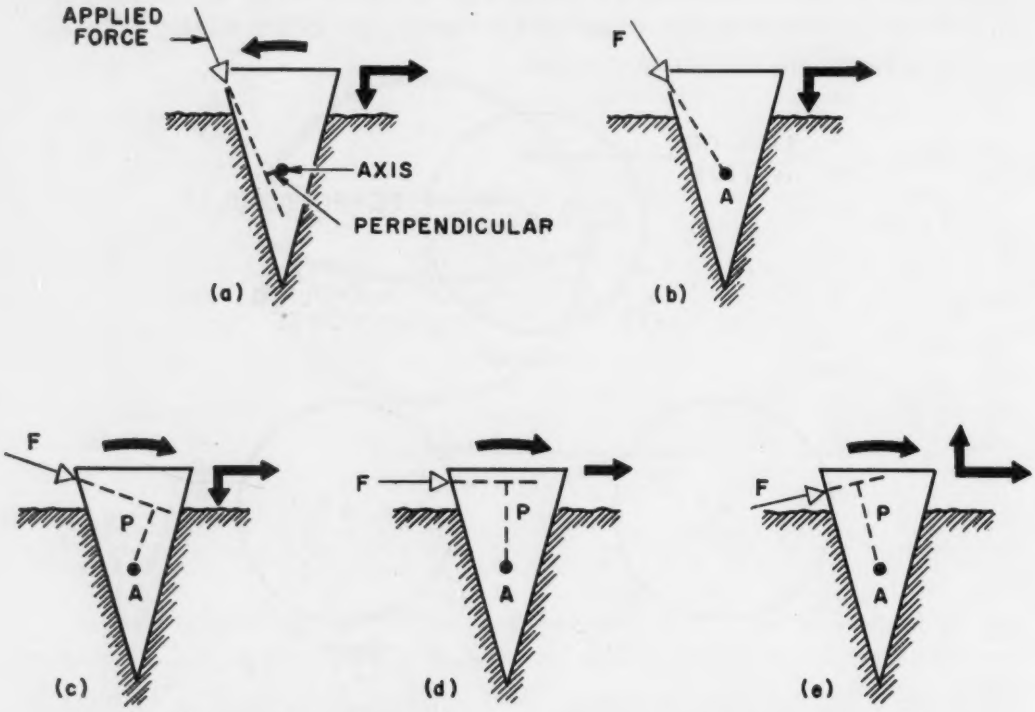


Fig. 9.—Motion of stake in the ground. Approximate center of rotation at *A*. Heavy straight arrows indicate directions of translational movements; curved arrows indicate tipping displacements. *a*, Movement downward and to right, counterclockwise rotation; *b*, movement downward and to right, no rotation; *c*, movement downward and to right, clockwise rotation; *d*, movement to right only, clockwise rotation; *e*, movement upward and to right, clockwise rotation.

goes through the axis, in Fig. 9, *b* there will be no rotation. Here, however, the stake will translate bodily as indicated and if, by the resistant forces, the fulcrum is later shifted, a rotational motion could result, depending upon which side of the line of action the new fulcrum lies.

Mechanically, a tooth embedded in the bone is very much like a stake in the ground. Like the stake, a tooth under the action of an external force will experience a slow translational as well as rotational motion. The stake pictured in Fig. 9 may be thought of as a crude outline of a lower left molar with force *F* coming from the mesial side; if the drawing is turned upside

down, the tooth represented becomes an upper right molar. Such an upper right first molar with a more anatomic look is depicted in Figs. 10, 11, and 12.

With this concept in mind, assuming distal moving of the tooth is desirable, how is this to be accomplished? The two methods now in use involve either a headcap or a necktape, both of which supply anchorage for the direction of the applied force through the rubber band.

As with the stake, the exact rotation center or fulcrum for any tooth is not known. However, it must lie between the neck of the tooth and the apical region. In many instances, investigators[12-20] of tipping movements have found the fulcrum to lie in the region between the middle and apical thirds of the root portion, as indicated by *A* in Figs. 10, 11, and 12.

METHODS OF EXTRAORAL ANCHORAGE

We make the basic assumption, the validity of which is borne out by experience, that the tooth, band, and traction arch effectively constitute a rigid body, once the elastic force (*F*) is applied.

We now investigate the motion of the tooth (1) as the anchorage is altered in the headcap when the vertical position of the headcap hook is changed and (2) with the necktape as the angle of the traction bar or face-bow is changed in relation to the traction arch or dental bow and as the length of the face-bow is increased.

In Fig. 10 an upper right molar under *headcap anchorage* is diagrammed with the traction arch assumed parallel to the occlusal plane (see also Fig. 5). The line of elastic pull is along the elastic band in Fig. 5. As this line is altered by raising or lowering the hooks on the headcap, the traction bar will likewise move with respect to the traction arch, thus altering slightly the angle between the bar and arch, as indicated in Fig. 10, *a* to *e*.

If the line of elastic pull makes an upward angle with the traction arch (Fig. 10, *a*, *b*, and *c*), there will be an upward component of the force and the tooth will then tend to be pressed into the socket, while if the pull makes a downward angle with this arch (Fig. 10, *e*) there will be a downward component of the force with corresponding extrusive movement. If the line of elastic pull is parallel to the traction arch (Fig. 10, *d*), the effect of *purely translational* motion of this tooth would be neither intrusive ("depression") nor extrusive ("elevation"). Note, however, that the tipping will produce an extrusion of the mesial marginal ridge and an intrusion of the distal marginal ridge. These effects will be discussed further later. It should be emphasized that with extraoral anchorage the tooth always tends to move distally, regardless of other movements, since there is always a backward component of the applied force.

The *rotational* or *tipping* motion of the tooth is governed by the relation of the line of force to the fulcrum. Thus, in Fig. 10, *b*, where the line of pull passes through the fulcrum, there will be no tipping. If the perpendicular to the line of pull is apical to the axis (Fig. 10, *a*) the perpendicular (*P*) will tend

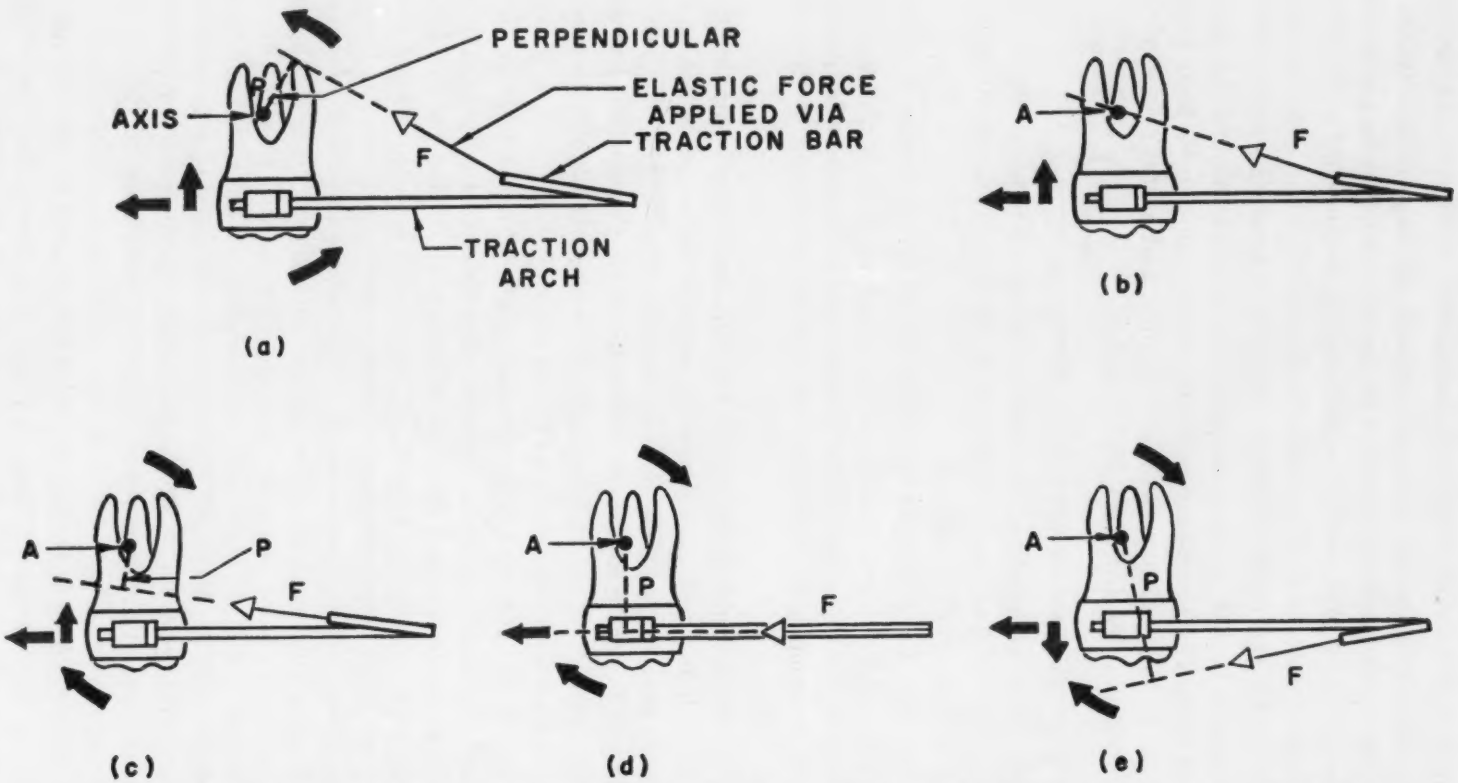


Fig. 10.—Motion of upper right molar under headcap anchorage. Approximate position of fulcrum at *A*. Heavy straight arrows indicate directions of translational movement; curved arrows indicate tipping displacements. *a*, Line of elastic force apical to occlusal plane and also apical to fulcrum. (*Result:* Distal and intrusive movement; *mesial* tipping.) *b*, Line of force apical to occlusal plane and passing through fulcrum. (*Result:* Distal and intrusive movement; *no* tipping.) *c*, Line of force apical to occlusal plane and occlusal to fulcrum, that is, "above" the traction arch. (*Result:* Distal and intrusive movement; *distal* tipping.) *d*, Line of force parallel to occlusal plane and occlusal to fulcrum, that is, at right angles to the long axis of the tooth. (*Result:* Distal movement only, no intrusion or extrusion; distal tipping.) *e*, Line of force occlusal to buccal tube and occlusal to fulcrum. (*Result:* Distal and extrusive movement; *distal* tipping.)

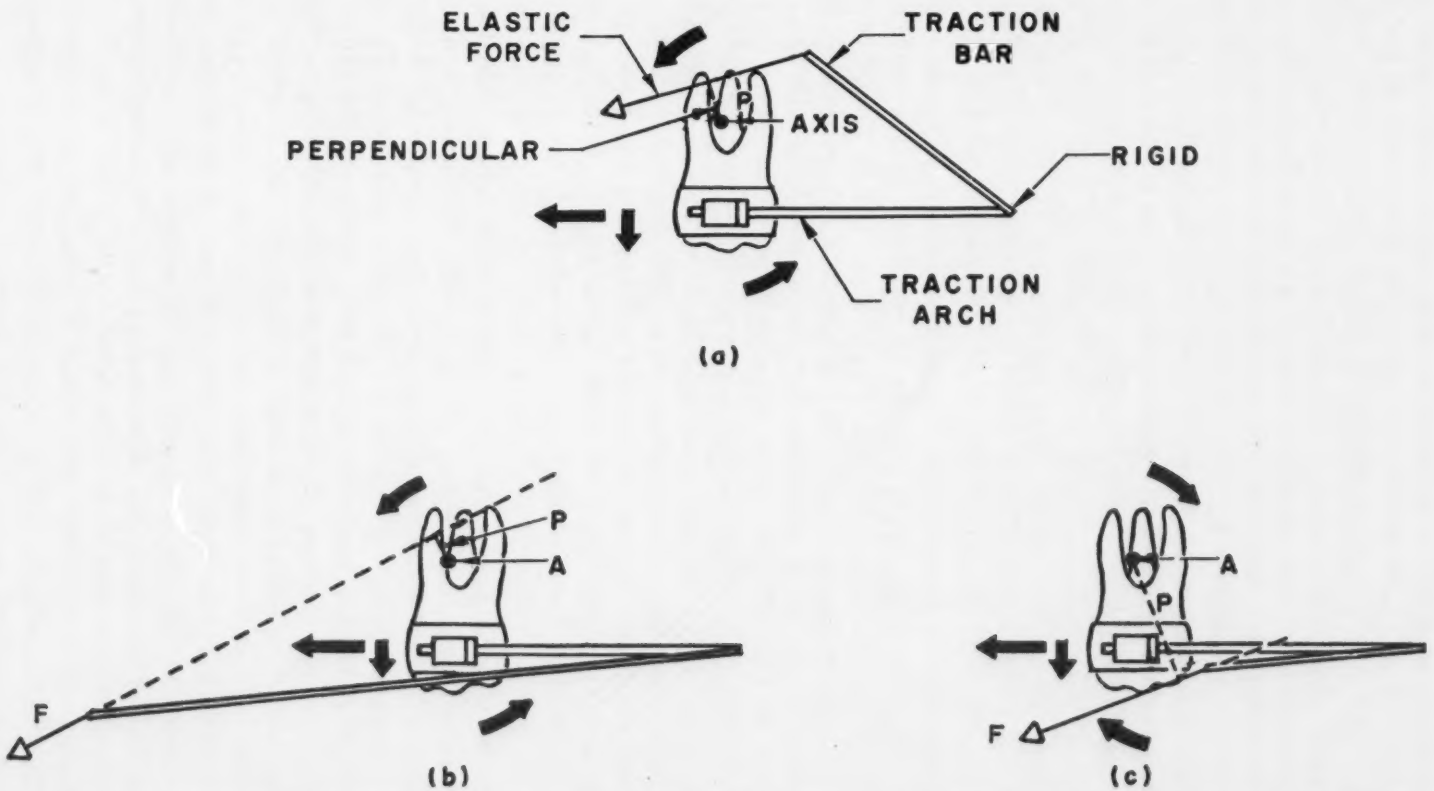


Fig. 11.—Motion of upper right molar with cervical anchorage. Heavy straight arrows indicate directions of translational movements; curved arrows indicate tipping displacements. *a*, Long face-bow with upward angle, line of force apical to axis. (*Result: Mesial* tipping, distal and extrusive movement.) *b*, Long face-bow with downward angle, line of force apical to axis. (*Result: Mesial* tipping, distal and extrusive movement.) *c*, Short face-bow, line of force occlusal to axis. (*Result: Distal* tipping, distal and extrusive movement.)

to rotate counterclockwise and the tooth will tip mesially, while if the perpendicular projects occlusally (Fig. 10, *c*, *d*, and *e*) the tooth can tip only distally. This would be true even if the traction arch and traction bar were in the same plane and even if the rubber-band pull were also parallel to the occlusal plane (Fig. 10, *d*). In summary, the various tooth movements that result as the hook attachment on the headcap is lowered are illustrated in Fig. 10, *a* through *e*. It should be added that, although the case of simultaneous mesial tipping and extrusive movement has not been illustrated in Fig. 10, such can be achieved via the use of a somewhat longer traction bar that makes a steep upward angle with the traction arch, the relationship being as shown in Fig. 11, *a*.

Let us pause here to define our anchorages. *Cervical* anchorage is anchorage which comes from the nape region of the headcap or from cervical gear, while *occipital* anchorage lies farther up on the occipital or cranial portions of the headcap. The forces in Fig. 10, *a*, *b*, *c*, and *d* come from occipital anchorage, while Fig. 10, *e* and Figs. 11 and 12 demonstrate cervical anchorage.

We now examine the mechanics of *cervical anchorage* from either headcap or neckgear. To prevent the distal tipping of maxillary molars when using cervical anchorage we must consider two dimensions: (1) the angle between the traction bar and traction arch and (2) the length of the traction bar itself. These dimensions should be so combined that the elastic force will cause the perpendicular *P* in Fig. 11, *a* to rotate counterclockwise, indicating that the crown would do the same. While the bar angles *upward* in this figure, one observes that in Fig. 11, *b* a similar mesial tipping movement is achieved even though the traction bar makes a *downward* angle with the traction arch. The tooth movements illustrated in Fig. 11, *b* would occur even if arch and bar were parallel to the occlusal plane. Note, however, that in Fig. 11, *b* this is possible *only because the traction bar has been made long* compared to the length in Fig. 11, *a*.

Although the traction bar in Fig. 11, *c* extends back farther than the one in Fig. 10, *e*, nevertheless they produce the same tooth movements, and would do so even if parallel to the traction arch or to the occlusal plane. Both bars are short compared to the bar in Fig. 11, *b*. No matter how far up the short traction bar in Fig. 11, *c* is bent, the applied force can never tilt the crown mesially. Of course, any tendency of the molars to tip distally could be resisted by connecting them with the teeth in front of them, but this procedure then puts an extrusive force on these other teeth.

In all the mechanical arrangements of Fig. 11, an extruding force is exerted on the teeth. It has been suggested that this elongating force upon the maxillary first molars helps to open a close-bite. If this is true, cervical anchorage certainly should not be used in open-bite cases.

It is evident from the drawings (Figs. 10, *c*, *d*, and *e*, and 11, *c*) that as the crowns lean distally, their apices tend to move mesially. If left in that position, as a rule the apices would be farther from their correct positions than at the beginning of treatment. Furthermore, as the tipping progresses the mesial root is pulled down, while the distal root is pushed up into the socket, thus altering the

relationship of the mesial and distal marginal ridges to the occlusal plane. Clinically, these effects are somewhat counteracted by the resistance of the periodontium and the occlusion.

The corresponding results of mesial tipping can be similarly deduced. Should the mesial tipping of the molar become excessive, this action may be reversed by bending the long traction bar farther down than in Fig. 11, *b*, aiming it at a place definitely below the anchorage point, as in Fig. 12.

If, with cervical anchorage, it is desired to combine an intrusive movement and mesial molar inclination, the hooks of the traction bar could be aligned far forward and far below the anchor hooks, as the cheekpiece of a horse's bit.

These considerations, therefore, indicate that statements such as those of Kloehn,[11] namely, "the face bow (traction bar) should lie above the arch wire" or "lie close to the lower border of the mandible," are not definite enough. With either arrangement, as the length and angulation of the face-bow are changed, the crown can be tilted forward or backward.

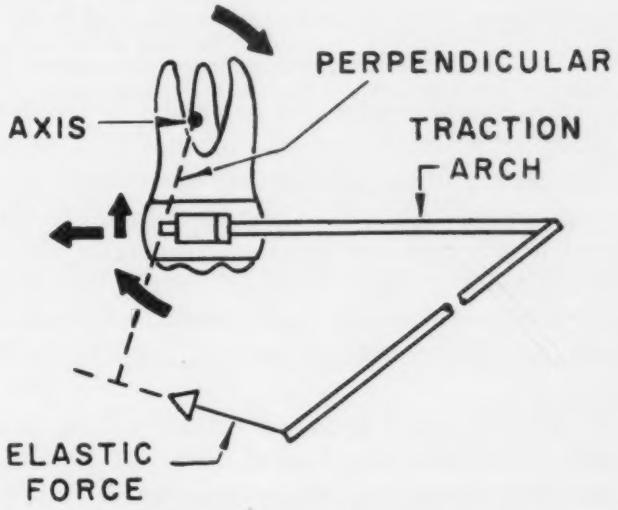


Fig. 12.—Long face-bow with greater downward angle than Fig. 11, *b*. (*Result: Distal* tipping, distal and intrusive movement.)

Thus far we have been discussing the mechanical principles involved when the extraoral device is attached directly to a molar. However, when a cervical apparatus is hung on an upper edgewise arch, the extrusive force from this anchorage would tend to make a close-bite worse.

In an effort to stop this downward tendency from *cervical anchorage*, Fischer[8] rests the traction bar (occipital bow) in a "stop-hook" fastened to the headcap. This stop-hook now becomes the axis for a more complicated grouping of mechanical forces; even with the stop-hooks in the positions shown, an overall extrusion of the upper dentition would probably continue, counteracting the attempted correction of the curve of Spee. Since a headcap is being used anyway, it seems simpler to use *occipital anchorage* from hooks placed higher up, as in Fig. 5, to intrude the anterior teeth and carry the whole upper dental arch posteriorly.

If, nevertheless, cervical anchorage be preferred with a full-banded upper setup, the traction arch should be attached directly to the molar band by a separate tube so as to be completely independent of the labial arch and the face-bow should be so adjusted as to have a definite mesial tipping action on the molar crown as in Fig. 10, *a*. Happily, for improving the curve of Spee in a lower jaw, this downward component could be made an ally by attaching the traction arch to the labial arch between the lower canine and lateral incisor.

SUMMARY

Under the action of a force, the tooth will alter its position just as does the stake in Fig. 9. To maintain the desired direction of movement, the general relationship of force to fulcrum must be maintained as the position of the tooth changes. This means that the apparatus must be continually adjusted. With occipital anchorage this is accomplished by raising or lowering the hooks on the headcap. On cervical gear, a similar effect is achieved by bending the face-bow (traction bar) up or down.

CONCLUSION

We have examined some mechanical principles involved in moving teeth and their application by means of two types of apparatus, namely, the headcap and necktape. The main purpose of each is to carry teeth backward, and each method can do this successfully. However, certain other movements, which cannot be achieved by the necktape without considerable difficulty, can be accomplished with the headcap. For example, it would be extremely difficult to combine intrusive and mesial tipping components on a maxillary molar using cervical anchorage, since the necessary length of the face-bow would render it impracticable.

As generally used on upper teeth, an extrusive force is always latent in cervical anchorage. The higher the traction bar hooks are placed (Fig. 11, *a*), the greater the extrusive factor. Increasing the length of the traction bar (Fig. 11, *b*) also increases the extrusive component since the more the bar is lengthened, the more this component increases with respect to the distal component. With the headcap, however, any simultaneous combination of vertical movement and tipping is easily achieved, as previously discussed.

In addition, when the teeth on just one side are to be moved by an offset traction bar (Fig. 6, *b*) the necktape would be less stable than the net headcap with its greater resistance to displacement. In the event that both lower and upper teeth are to be moved simultaneously, the headcap enables one to use separate points of anchorage for each jaw. Then the nylon net distributes this pressure over the entire head (Fig. 5). The necktape, however, provides only a single point of anchorage for both jaws, resulting in greater pressure on a small area.

Satisfactory orthodontic movement can be maintained by a pull sustained for an eight-hour interval each day. This principle should eliminate the necessity for appearing in public with either necktape or headcap and their accompanying protrusive facial armature.

As extraoral anchorage is coming into greater acceptance by orthodontists, it is important that they understand the principles of its operation so as to achieve the desired results. Since the headcap allows a greater range of movements than the necktape and permits the operator to visualize more easily the positions and directions of the forces employed, it seems the more desirable.

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A DIFFERENT APPROACH TO EXTRACTION

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WHEN a subject is chosen rather than assigned, an explanation is in order. For a good many years, the subject of extraction (particularly the extraction of atypical units) in orthodontic treatment has been of special interest to me. Having arrived at the inevitable but unenviable stage where one finds second-generation patients constituting an increasingly large proportion of his practice, it is enlightening to look back over a sizable number of failures and realize that probably many of them were the result of not having removed teeth. At the same time, one can ponder the rather remarkable switch in the attitude of a segment of the profession toward extraction in the last fifteen years. The suspicion remains that, while the retention of a full complement of teeth is simply not possible in every case, neither is the removal of four premolars in the moderately crowded case the panacea which wishful thinking would make it. In hope that a less drastic reduction in tooth structure might be the answer to handling a certain group of cases, this article will consider a few substitutions for the currently conventional multiple premolar extraction and suggest a different approach to diagnosis.

No one attends a meeting, particularly a meeting held in such delightful surroundings as this, for the purpose of changing his philosophy of treatment; therefore, no attempt will be made to do other than outline a few alternative courses to follow which occasionally might apply to the treatment of individual problem cases that do not quite seem to fit the usual extraction pattern.

To justify an article with such an objective, it is necessary to point out some of the shortcomings of premolar removal in such wholesale lots as now occurs. In true disharmony cases there can be no disagreement and the reduction of that amount of tooth structure necessary to produce structural balance is required. But as the lack of supporting bone, when gauged by any accepted means, be it cephalometric appraisal or cast sectioning, becomes less marked and approaches more closely the adequate amount, then removing some 28 mm. of tooth material becomes a radical procedure. For one thing, it tends to increase the overbite; second, it requires extensive root movement to close the spaces; and, most important of all, it is difficult to maintain contacts in the arch and avoid eventual reopening of the spaces. The spaces are

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especially inclined to reopen if the premolars are removed as soon as they erupt and before the prepubertal growth spurt has changed the picture entirely.

As a partial example, the casts of a dental student's mouth shown in Fig. 1 reveal a normal occlusion on the right side and a considerable amount of crowding on the left. This is more pronounced in the maxilla. Following the Tweed philosophy an orthodontist removed four first premolars and, with skillful edgewise treatment, produced an apparently satisfactory result.

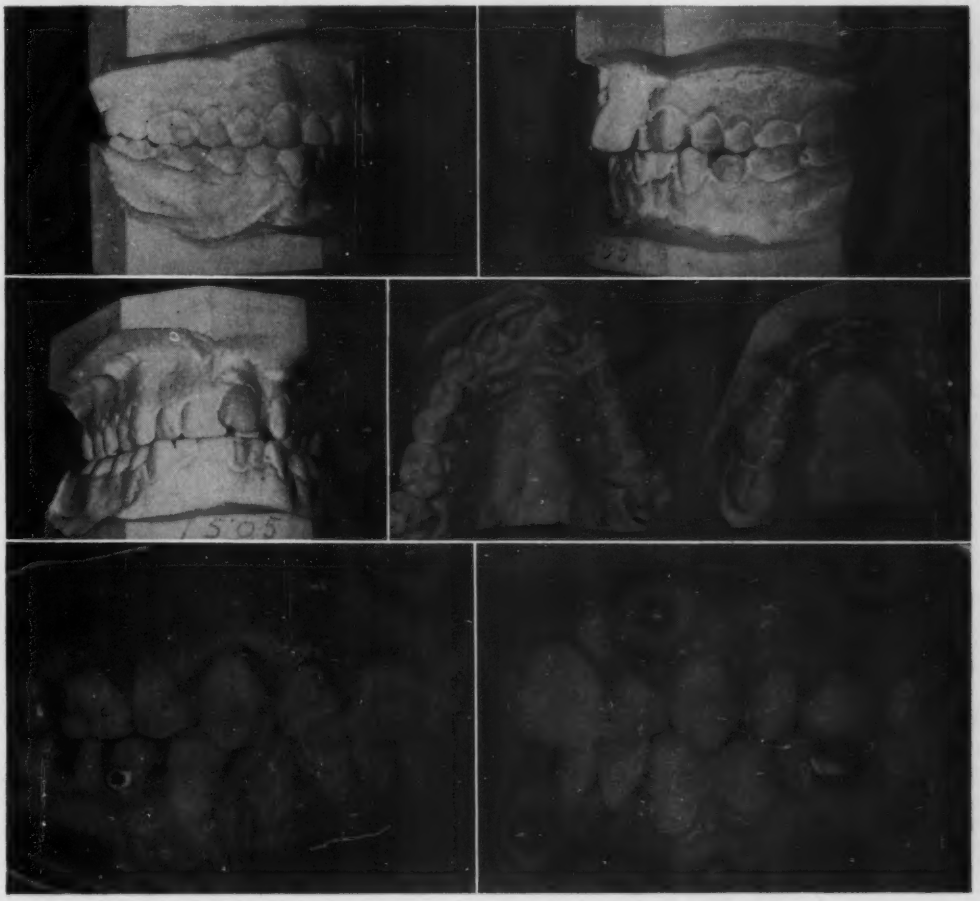


Fig. 1.—Reopening of space at extraction site in the upper right quadrant with loss of occlusal contact two years after retention was discontinued.

Photographs taken at the present time, two years after retention was supposedly completed, reveal what has happened to the right side. A sizable space has opened at the extraction site and the second premolar is out of occlusion. Rather than disturb an occlusion as good as this was on one side, it would seem that extraction of the first premolar on the upper left and alignment of the upper incisors, followed by a reappraisal of the condition at that time to determine whether the asymmetry thus produced was objectionable, would have been a better course to follow. With such a concentration of

crowding in the upper left lateral incisor area, I doubt that the midline would have shifted to a noticeable degree; if not, a lower incisor could then have been removed and the lower anterior teeth realigned without disturbing the original setup on the right. Treatment time would have been reduced and, from the standpoint of oral health, the patient would have been better off.

How important are these drawbacks to removing four premolars? From the periodontal standpoint, failure to reduce the deep overbite, close the spaces efficiently, and maintain tooth contacts in the arch is fraught with more potential danger to dental health than residual or recurring crowding, which is the usual result of over-conservatism in treating crowded cases. But while the patient is well aware of what happens to anterior tooth alignment, he remains blissfully unaware of what occurs in the rest of the mouth. As a result, he does not return to the orthodontist, who may never discover that the end of the retention period marked the beginning of relapse. The exact incidence of these relapses is not known. Our periodontal department at the University of Pennsylvania would like to conduct such a study of the 20- to 30-year-old group of posttreated orthodontic patients. Actually the practice of removing premolars in such a large percentage of cases has not been in vogue long enough to produce statistics on what happens to the soft structures years later. However, the fact that most of the men who have been in practice for more than twenty-five years have always been willing to extract teeth when they felt it necessary and yet have never become so satisfied with the results that they have swung violently over in that direction is rather eloquent evidence that extractions, in the long run, have drawbacks.

It is necessary, however, to be certain that one's antipathy toward this type of extraction does not stem from a lack of skill in handling appliances rather than from opposition to the principle involved. I think, rather, that the reverse is true—that too much confidence in the ability of modern multiple-band appliances to close spaces leads to overstepping the limits of the case in arriving at a diagnosis.

In recent years I have watched the reactions of graduate students to clinical experience with various philosophies of treatment. It would seem that they are very likely to find the available evidence, as gathered from the limited numbers of cases they see in the clinic, weighing heavily in favor of extraction as opposed to nonextraction in the moderately crowded case. As examples of this available evidence, let us examine two cases treated in our clinic.

CASE 1 (FIG. 2).—The patient was a girl, aged 12 years, with no significant hereditary background. Her facial development was within one standard deviation from the normal for her age, except for a variance of two standard deviations in the porion-incision figure, which is a reflection of incisor protrusion. Her facial pattern, as noted also in the cephalogram, is not a bad one. The overjet is aggravated by the retained deciduous canines. With this favorable growth picture, the case was treated without extraction and a rather satisfactory result was obtained.

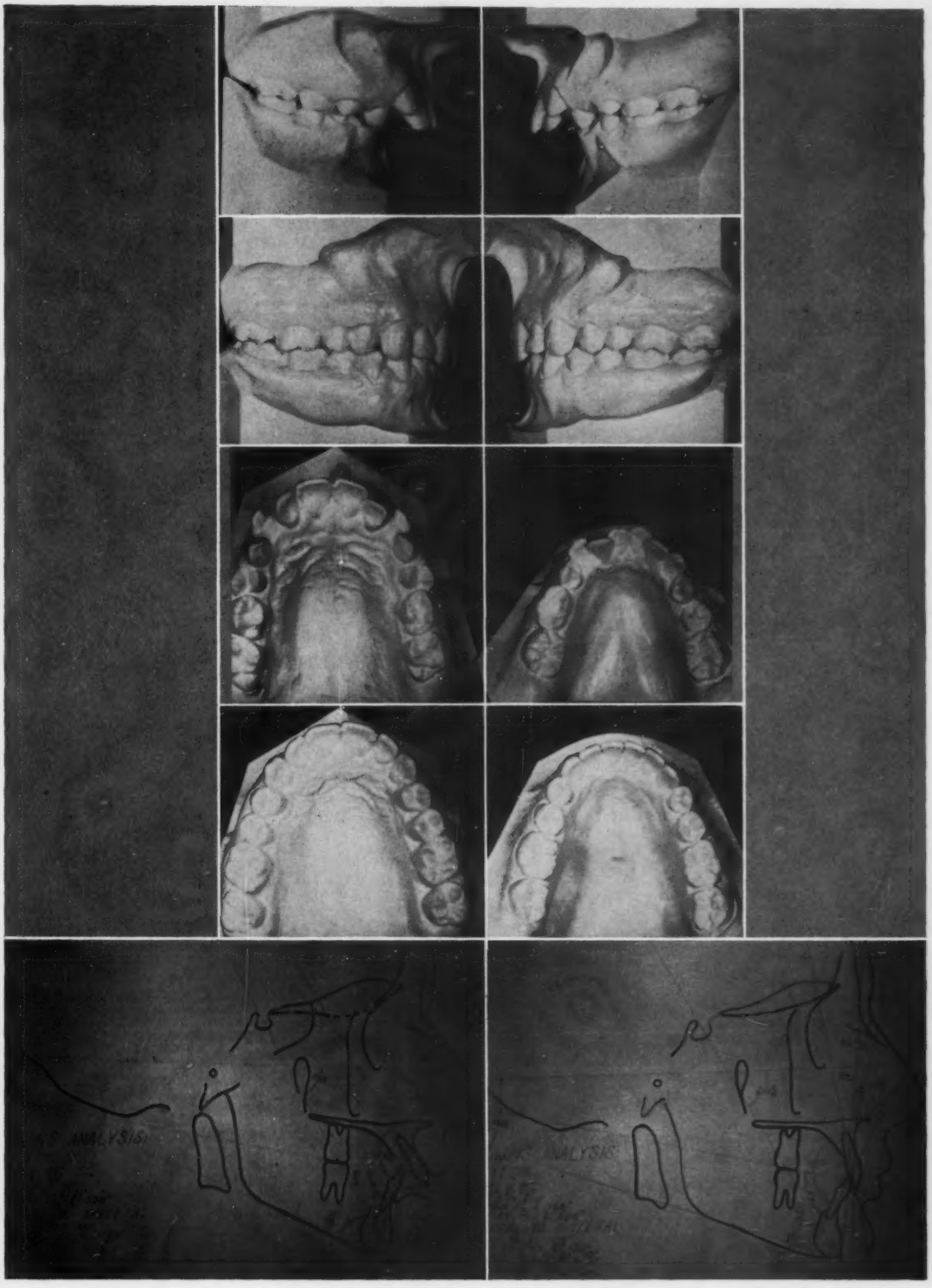


Fig. 2.—Nonextraction case. Casts and cephalograms before and after treatment. Treatment time required was three years.

CASE 2 (FIG. 3).—A girl, aged 11 years 6 months, presented a different but entirely adequate growth pattern with no marked discrepancies or deficiencies. Her profile in the cephalogram is good. Four premolars were removed. The result is fine, possibly less open to criticism than the first.

The student knows only this much about the two results. Both were obtained with the same type of appliance. The first case was under active treatment for exactly three years; the lower incisors have a slightly greater procumbency now and therefore may show a marked tendency to relapse. Case 2, on the other hand, was completed in one and one-half years; the incisors are upright, the spaces are closed, and the retention problem apparently will be simple. Esthetically, there is little to choose between the two results There is no way of knowing the eventual outcome of the two cases. Maintenance of space closure may be as much of a problem in one as a tendency to collapse is in the other. To the graduate student extractions presented by far the simpler and more inviting method of attack. Actually, when the student was reporting this second case in a seminar session after treatment was completed, he used an expression which unconsciously reflects the way many orthodontists actually feel. He had reviewed the examination findings and read the very favorable report from the Growth Center, where Dr. Wilton M. Krogman does preliminary studies on all the clinic patients, and then concluded the case analysis with this statement: ". . . and so we removed four bicuspids."

This understandable inclination toward extraction is reinforced by reading the preponderance of articles in the journals emphasizing cephalometric diagnosis almost to the exclusion of considering etiology or studying intraoral and lateral plate x-ray pictures, and relegating the patient himself to a secondary role. The delusion that a diagnosis can be made mathematically in the patient's absence is then complete. In many cases the diagnosis calls for extraction and extraction, in turn, means the routine removal of four premolars. This decision is final and, unfortunately, irreversible.

Actually, most of us (not just students) think of extraction as meaning just this—the removal of four premolars. Substantiating this is Dr. C. Edward Martinek's interesting article in the April, 1956, issue of the AMERICAN JOURNAL OF ORTHODONTICS, in which he appraised five consecutive cases in his own practice on the basis of four common methods of analysis used to aid in deciding about the adequacy of supporting bone for the existing tooth structure. Of the five cases, one was obviously a disharmony case and one was very definitely a nonextraction case, whereas in the other three the results of this multiple analysis were neither conclusive nor uniform. In all four of the analyses, however, the choice was only between retention of the full complement of teeth or removal of these same four units. That the four analyses did not concur is no sign that one method was superior to another as an aid in diagnosis; it is merely indicative of the limitations of *any* method when applied to a borderline case.

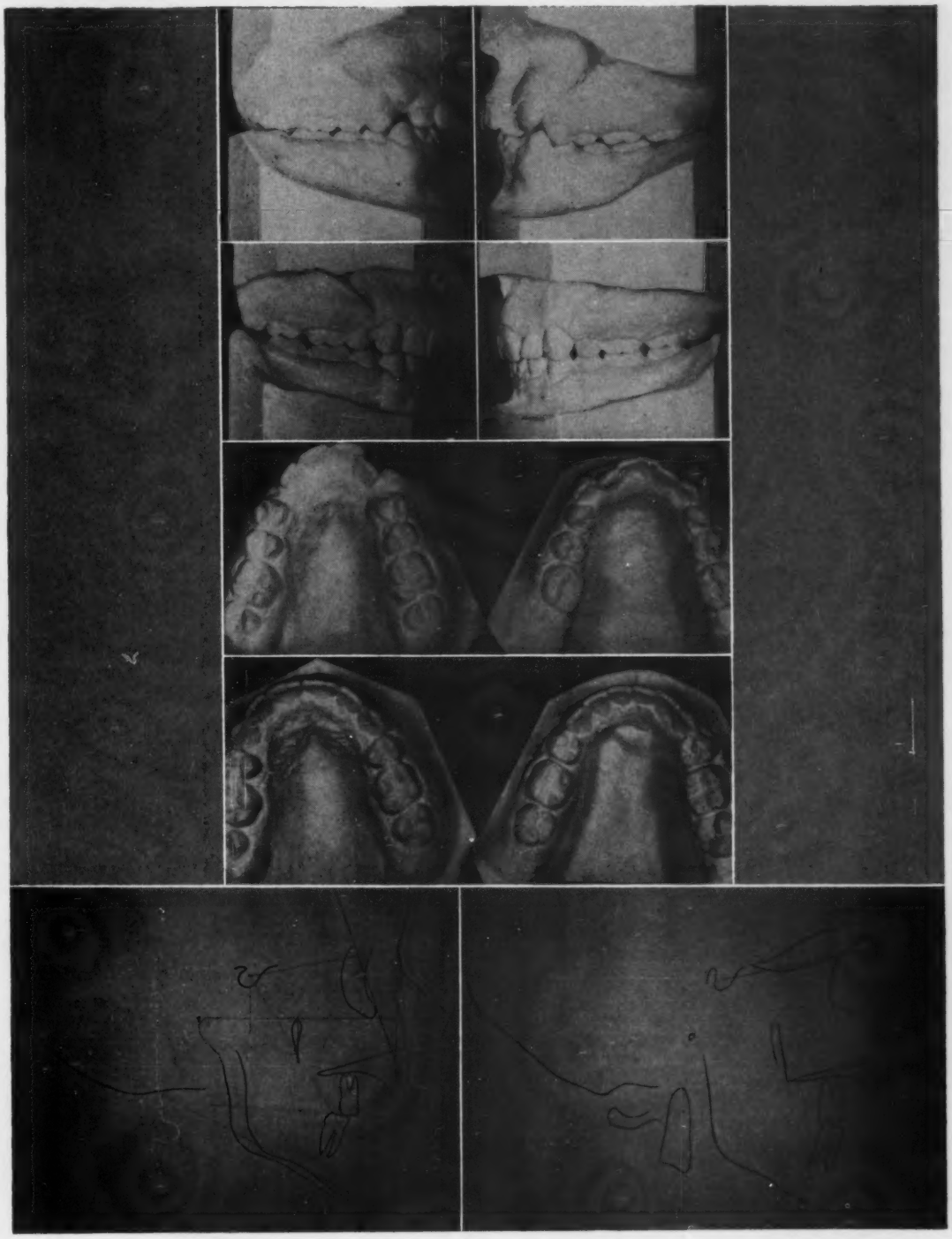
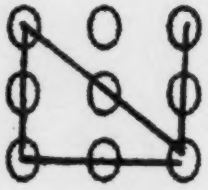


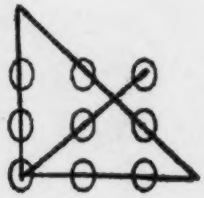
Fig. 3.—Four-premolar extraction case. Casts and cephalograms before and after treatment. Treatment time required was eighteen months.

If extraction does have this one meaning in orthodontics, it still does not particularly matter whether one's attitude toward it is radical or conservative. He must somewhere establish a sharp line of demarcation between what does and what does not constitute an extraction case. Then, if one accepts the hypothesis that the extraction of four premolars does have certain drawbacks and that overconservatism in retaining teeth also invites failure, these very shortcomings are most pronounced near this arbitrary line or borderline zone where the ratio of supporting bone to tooth structure is more nearly adequate.

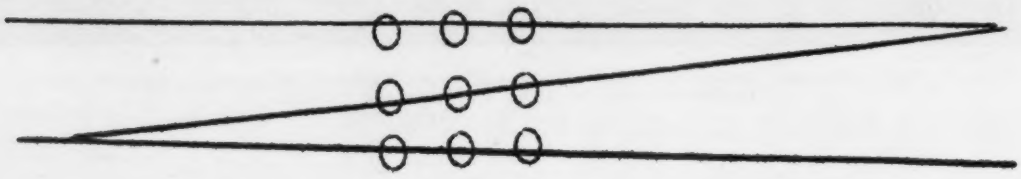
It might be of some value to everyone, most certainly to the younger men starting out in this field, to have recourse to other methods of treating these borderline cases which present particular difficulties in diagnosis. If one admits that at times neither of the conventional methods leads to completely satisfactory results, then a search for an alternative course becomes worth while. A completely new viewpoint in diagnosis is imperative in seeking a solution. There is an analogy in the old brain teaser which all of you may have seen:



The nine circles are to be connected with no more than four straight lines, drawn without removing the pencil from the paper. Until one discards the *self-imposed* limitations of staying within the square, it cannot be done, and yet the solution becomes obvious the minute one crosses this boundary:



A still further lack of inhibited thought suggests a third, and possibly still not ultimate, solution:



In orthodontics this constricting and self-imposed boundary can be breached by breaking away from the aforementioned tendency to consider extraction as always meaning four premolars and by determining, instead,

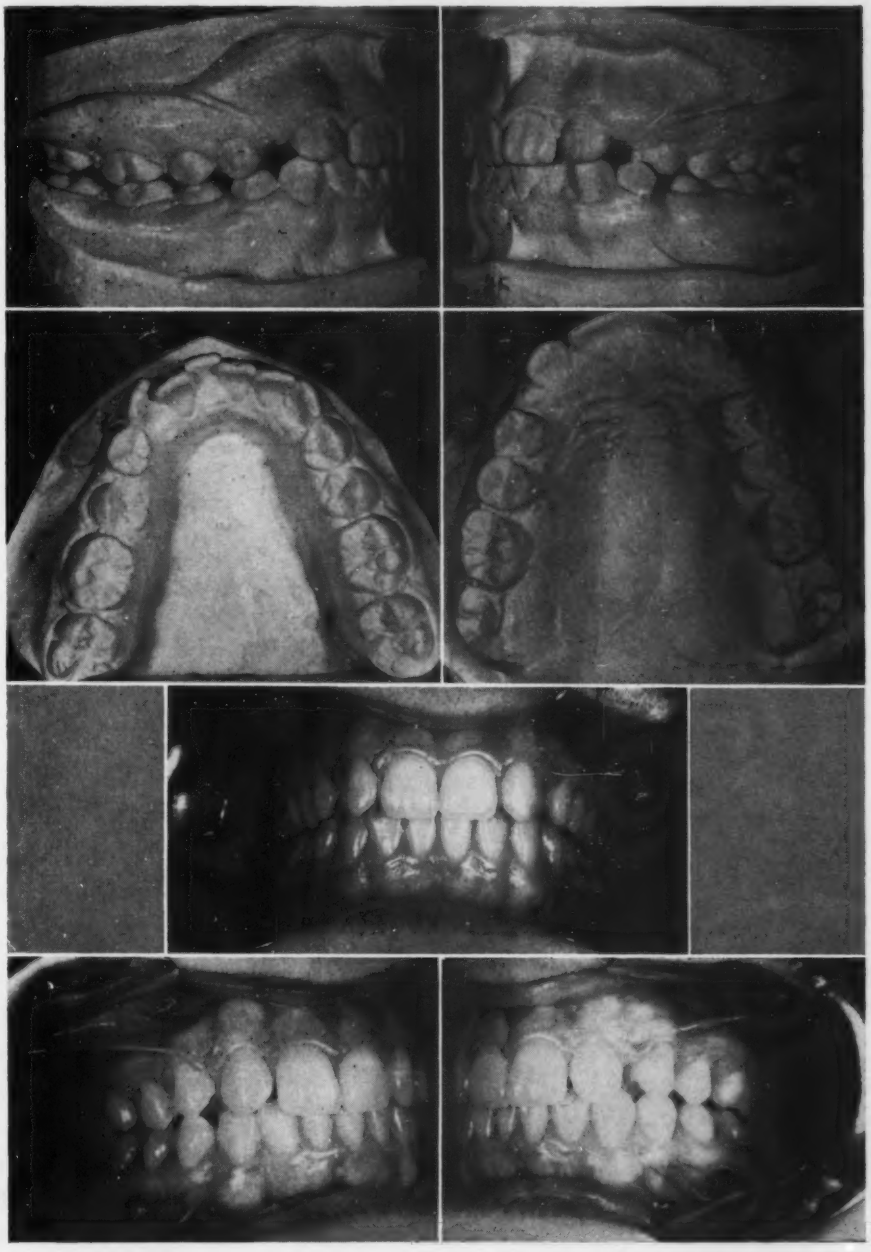


Fig. 4.—Case involving congenitally missing maxillary lateral incisors. Result stable two years out of retention.

exactly what the individual case requirements are in the way of space needed before making a stereotyped diagnosis as to extraction. Often the extra room needed would be ideally provided by the removal of part of a tooth in each

quadrant. Although this is rather beyond the realm of practicability, it is often possible to achieve a similar result by removing upper second molars and a lower central incisor. Then, by the additional distal driving thus made possible in the upper arch, and by closing of the incisor space below, these "half-size" increments in room can be obtained. Most of us have removed these teeth with satisfactory results in many cases. The extraction of teeth other than these, however, is much less common and, while applicable to a limited number of cases, it is often a perfect solution to specific problems.

Fig. 5.—Compromise result in accident case. The upper right lateral incisor has been fitted with jacket crown. The upper left central incisor in the original had been replanted and was exfoliated during treatment and replaced with a facing attached to a lingual arch.

There is plenty of precedent for doing this, however. Let us consider three types of cases, for example, where the teeth are already missing at the time the patient is first seen, either congenitally (Fig. 4), because of an accident (Fig. 5), or as an aftermath of caries (Fig. 6). Faced with a situation, not of choice, we all manage to come up with remarkably satisfactory results which require often the utmost in ingenuity and therapy and yet are peculiarly suited to the individual patient. Sometimes these are, at best, compromises, but often, from the standpoint of oral health and function, they are superior to more conventional results. With these results as justification, it is conceivable that the removal of *any tooth or combination of teeth* in the mouth may be the best solution to certain problems.

Without wishing to detract from the individual character of these atypical extractions, I feel that it is worth while to point out types of conditions where atypical extractions are likely to apply.

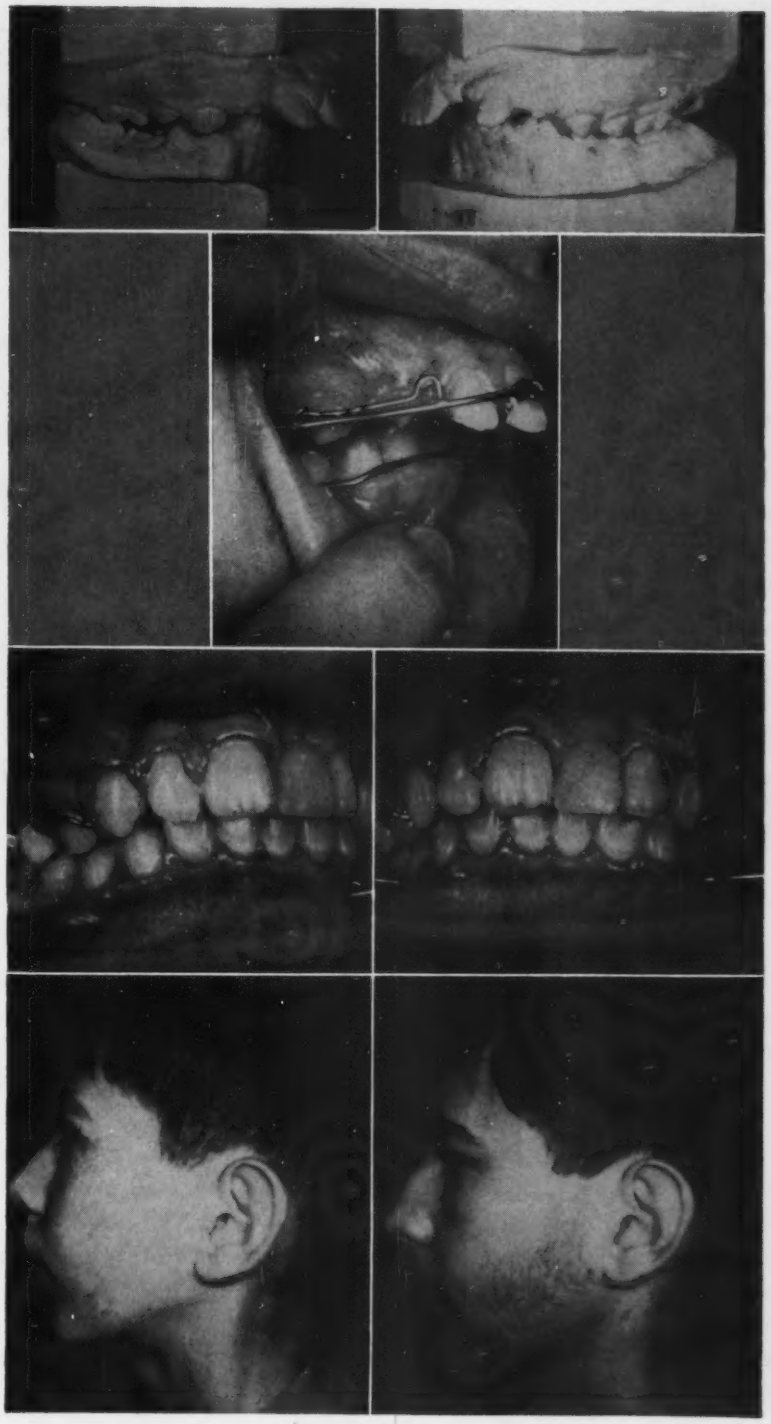


Fig. 6.—Case involving loss of four first molars due to caries and of upper central incisor in a fall. The incisor has been temporarily incorporated in a retaining device.

MAXILLARY SECOND MOLARS

In order even to consider the removal of upper second molars, the first requirement is x-ray evidence of third molars that are adequate from the standpoint of size and shape. When this has been verified, then extraction at this site facilitates the distal driving of the first molar and the concomitant creation of space mesial to it in those cases where the upper first molar occlusion is either cusp to cusp or mesial to the lower first molar. This is a particularly desirable procedure in deep overbite cases, as the invariable tendency is toward a lessening of incisor overlap, quite in contrast to the opposite tendency when premolars are removed. Other advantages are that it is easy then to use as much or as little of the extraction space as the case requires rather than being forced to close it completely, and the third molar erupts free of caries after the most susceptible period in the patient's life is over. This is, indeed, one of the few instances in dentistry of a replacement excelling the original.

Fig. 7.—Favorable axial inclination of maxillary first molar when extraction of maxillary second molar is being considered.

A favorable diagnostic factor is either visual or x-ray evidence of a mesial axial inclination of the first molars (Fig. 7), thus making possible distal driving without tipping these teeth to an unstable degree. Contraindications would go the reverse of this, that is: a distal axial inclination of the first molars, an already ideal Class I molar relationship, or a tendency toward an open-bite which undoubtedly would be aggravated by this type of treatment. When so many of our Class I and Class II cases are those with a mesial drift of upper teeth en masse, it is not infrequently that we have six-year molars already tipped forward to an unfavorable degree; a diagnosis that calls for an extraction mesial to them is putting a big load on appliances and expecting a lot in the way of bone growth to produce the necessary bodily movement of the largest tooth in the mouth. In this instance the removal of a second molar would require more crown movement, but tipping a molar involves fewer difficulties.

MANDIBULAR INCISORS

Disharmony in maxillary and mandibular tooth size is a very real and disturbing factor which interferes with achieving ideal results. Many untreated and otherwise normal occlusions are marred by either crowded lower

incisors or an unsightly diastema above. If the disharmony is very marked, the width of a single incisor below is often the approximate measure of this discrepancy. Incisor extraction is also worth considering in cases where there is one extremely malposed incisor, where one incisor has a badly receding gingival crest, and particularly in those rather common instances where the apical base is very constricted and the incisal crowns are badly flared as a result. At times a canine will also be tipped distally so badly as to make distal movement into a premolar extraction space impossible, whereas removing the lateral incisor permits it to move into vertical alignment (Fig. 8).

Fig. 8.—Case in which teeth were removed unilaterally. Extraction of the upper right second premolar was balanced by removing the lower right lateral incisor. The decided distal axial inclination of the canine was the decisive factor in the lower arch.

Incisor extraction tends to deepen the overbite and thus is contraindicated in many instances for this reason alone. By far the most attractive feature of removing a single incisor is the fact that it so often exactly fits the space requirement in the lower arch, which many times is much less than in the maxilla. Thus, removing one incisor will often offset the extraction of two premolars above in Class II cases. This is particularly true where the mandible is already well positioned and removal of two lower premolars would require extensive movement of the distal segments. It also permits the alignment of the remaining five anterior teeth without tipping them off the ridge.

UPPER INCISORS

Occasionally the removal of an upper lateral incisor or even a central incisor is indicated. Every orthodontist has handled accident cases where, following the loss of a central incisor, the patient has not been referred until much of the space was lost. The lateral incisor was then centered in the remaining space and jacketed and the rest of the occlusion was adjusted. Congenitally missing lateral incisors are also handled satisfactorily in many instances by closing the space. This is done, not because it is always the

simplest procedure, but because in these selected cases, either by requiring less extensive treatment, by eliminating the need for a bridge, or by avoiding extensive treatment in the lower arch, the patient's best interests are protected. With such cases in mind, it is logical to sacrifice an incisor intentionally when doing so allows the treatment to be confined more or less to one area of the mouth without disturbing the entire occlusion which otherwise may be entirely satisfactory. An example of this would be a case with a partially blocked-out maxillary canine which has a decided distal axial inclination of crown.

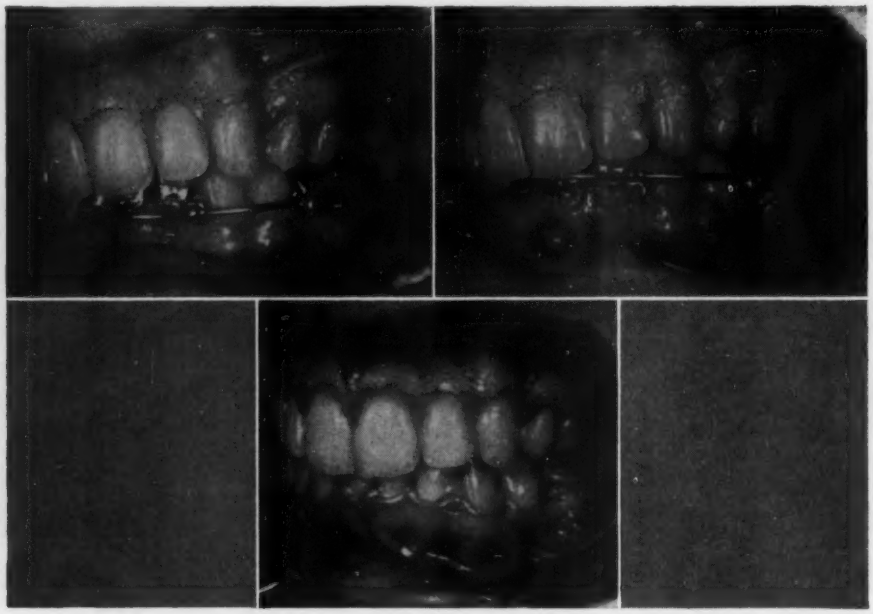


Fig. 9.—Lower labial arch of 0.030 precious metal with safety-pin loop at distal ends adjusted to upright molars.

Extraction of the lateral incisor would allow for a simple tipping of the canine into line. The resulting asymmetry may be as acceptable esthetically as though a premolar had been removed, for the unfavorable position of such a canine seldom permits enough root movement to match that of the one on the opposite side.

LOWER SECOND MOLARS

In a certain few marginal cases, the removal of lower second molars serves much the same purpose as in the maxillary arch. When the distal segments have drifted forward—possibly due to early loss of a deciduous molar—it is much easier to move the first molar distally with the second molar removed. Needless to say, the developmental path and inclination of the lower third molar are not nearly so favorable in the mandible but, with judicious selection of the case and with a practical method (Fig. 9) of tipping up the third molar if necessary, this is a most welcome alternative to removing other

units. As is the case with upper second molars, it allows the operator to utilize the exact amount of space needed, favors the reduction of the overbite, and eliminates the third molar impaction which might result if the conservative course of treatment without extraction were followed.

Extraction of the aforementioned teeth will certainly find limited application, but if one accepts the *possibility* of so doing, he has emerged from the confines of the square of the old puzzle and opened for himself a new avenue of approach to dealing with borderline cases.

Having gone this far in breaking out of the bonds of conventional thinking, it is easier to consider a second rerouting of one's approach to diagnosis. Most of us feel a compulsion to give an immediate diagnosis of the patient's case and, even when this diagnosis involves a decision to remove teeth, we do so. Urgency might require this in some branches of dentistry which deal with pathologic conditions. Certainly this condition does not enter into our field. In medicine, a physician might be hard pressed to give an immediate diagnosis and, by not even attempting to do so when in doubt, he prevents many an error in therapeutic measures. There is every reason to delay a decision about removing teeth if there is doubt in one's mind, as there so often is in the borderline case. While this delay may wreak havoc with a concise treatment plan, it permits the operator to begin preliminary treatment and to obtain an idea of tissue reaction and patient cooperation. There can be no substitute as a diagnostic aid for this extra time spent observing the patient himself.

As a practical example of this, one might proceed as in the Class I case shown in Fig. 10. The first major decision is whether or not to open up a space for the congenitally missing upper right lateral incisor. This decision can be made more easily after the incisors have been aligned and after the canine has erupted so that the patient, as well as the operator, may pass upon the esthetics of an upper arch with a lateral incisor missing. This alignment is easily accomplished in a few months of treatment, and in this particular instance the result at that time was mutually satisfactory. Rather than disturb the setup on the left side of the mouth, it was decided to remove the lower right first premolar and the central incisor; the progress photographs show how well the unusal combination of missing teeth in the two arches balances.

In some Class II cases it may be a distinct help in treatment as well as diagnosis to extract upper premolars and close the spaces before deciding upon the course to follow below. This provides undisturbed anchorage for the preliminary stages of treatment and in many instances no extraction at all, or the extraction of only one incisor, is needed below. It is not easy to predict accurately just how stable or unstable lower anchorage may be; after a few months of treatment it is no longer necessary to guess. Resisting the natural pressure from patients to make immediate decisions about extractions avoids many a needless extraction. In the case shown in Fig. 11, the growth potential as evidenced after a few months of treatment was sufficient to insure a successful result with a full complement of teeth.

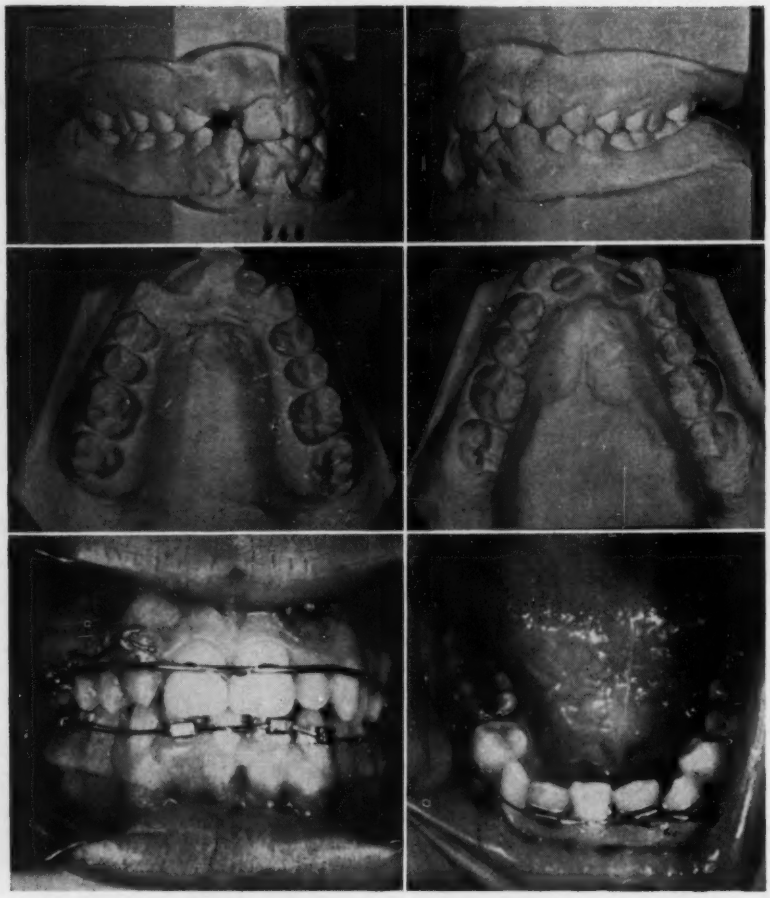


Fig. 10.—Progress photographs of a case with a congenitally missing maxillary right lateral incisor in which a decision to remove a mandibular incisor and first premolar on the same side was made after first aligning the upper anterior teeth.

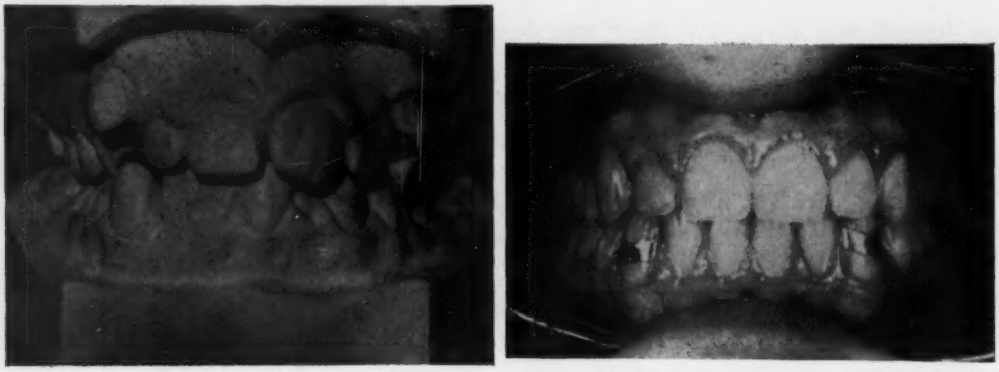


Fig. 11.—Class I malocclusion with completely blocked-out maxillary canines treated without extraction. An immediate diagnosis would have called for extraction.

APPLICATIONS IN TREATMENT

When such unorthodox procedures are followed in selected cases, the results may very well be termed *compromises.* In the usual sense of the word, this denotes a result which is somewhat suboptimum but justified by mitigating circumstances. Often more conventional treatment also produces a compromise result but the compromise involves the patient's best interests. Dr. Andrew F. Jackson* has ably supplied a standard by which to judge orthodontic results, a standard which cites as necessary prerequisites for success (1) structural balance, (2) functional efficiency, and (3) esthetic harmony.

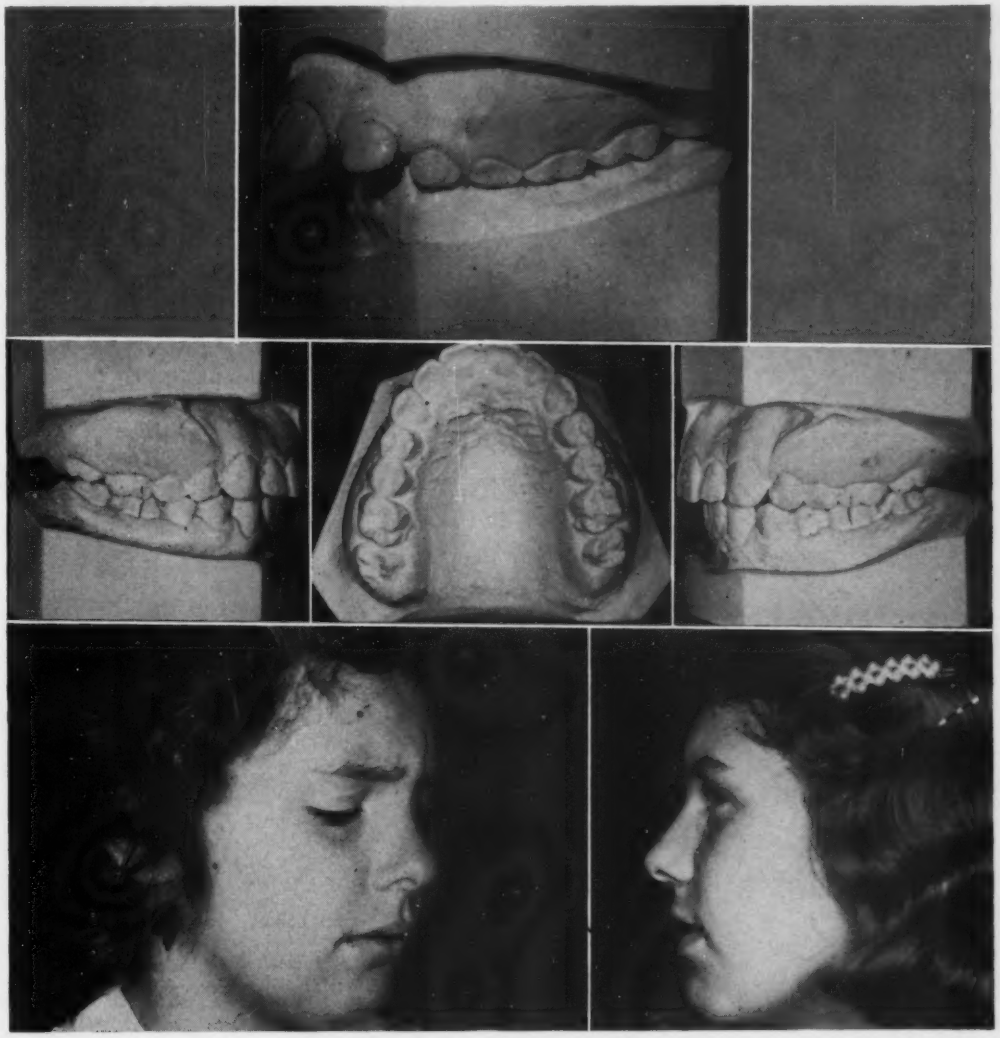


Fig. 12.—Case 1. Class II case in which it proved necessary to extract maxillary second molars to prevent relapse. Third molars have erupted unaided into ideal position at age 16.

The following cases may be judged on that basis as illustrating how well the principles outlined apply in actual practice.

*Jackson, A. F.: The Art of Orthodontic Practice, AM. J. ORTHODONTICS 34: 383, 1948.

CASE 1.—Fig. 12 shows the casts of an 8-year-old girl with a Class II, Division 1 malocclusion, treated in two stages because of facial involvement. Treatment up to the stage of retention at the completion of the second stage of the case was uneventful, but it was not possible to maintain the corrected mesiodistal arch relationship despite the use of intermaxillary elastics at night in conjunction with a Hawley retainer and a lower labial arch. Then upper second molars were extracted and a fixed appliance was replaced for a six-month period of retreatment. At the end of this time the upper lateral segments had been overdriven and retention was short and successful. The second set of casts was made three years after the final appliances had been removed. Note the ideal alignment of the upper third molars which erupted much ahead of the usual time.

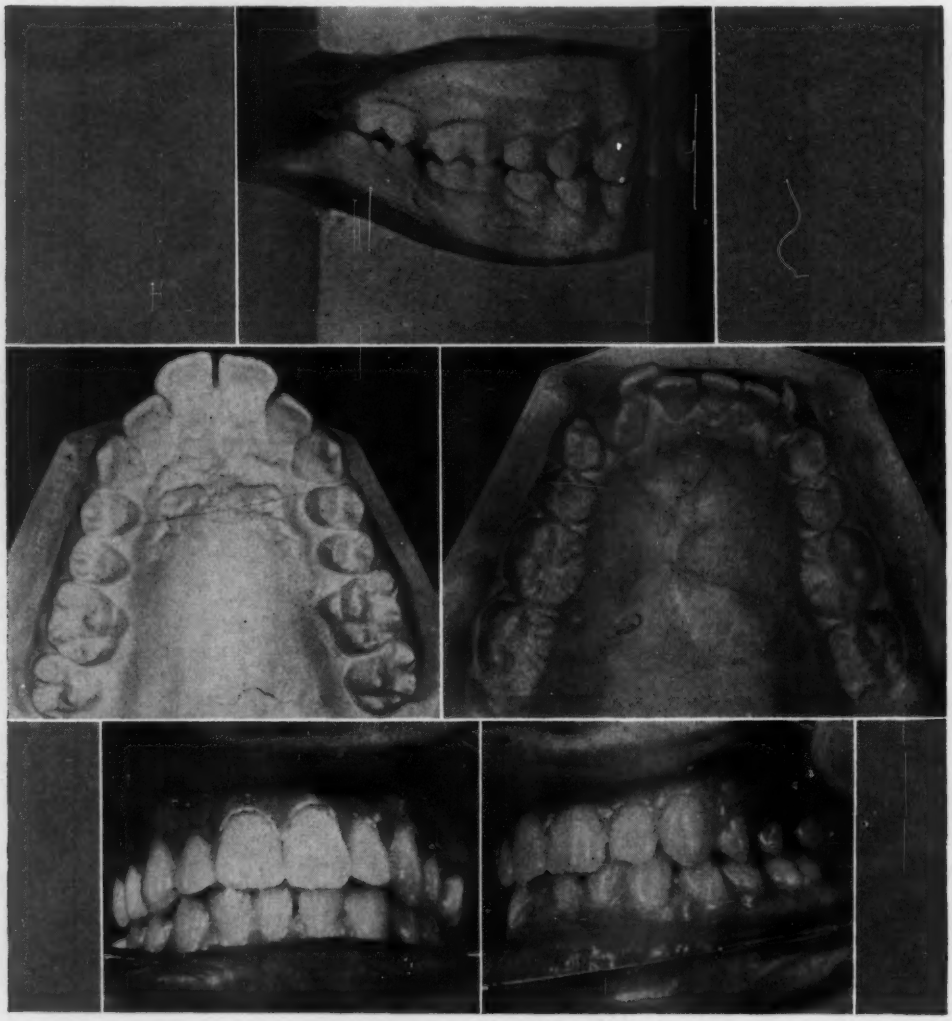


Fig. 13.—Case 2. Previously treated case with stable result obtained by removing maxillary second molars and lower left central incisor.

CASE 2.—Fig. 13 represents the relapsed condition of a Class II, Division 1 case treated several years previously without extraction. The boy was then 16 years of age. Because the parents had moved to Philadelphia at the time active treatment was completed, retention was unsupervised and consequently not adequate. Rather than risk retreatment without extraction, in view of the previous tendency to instability, it seemed advisable to extract

upper second molars to correct the molar relationship and in the lower jaw, because of the concentration of crowding in the anterior region, to remove just one central incisor. Intraoral photographs show the result after a retreatment period of fourteen months. The result has been maintained, and at least up until the time of his graduation from college there had been no tendency toward relapse.

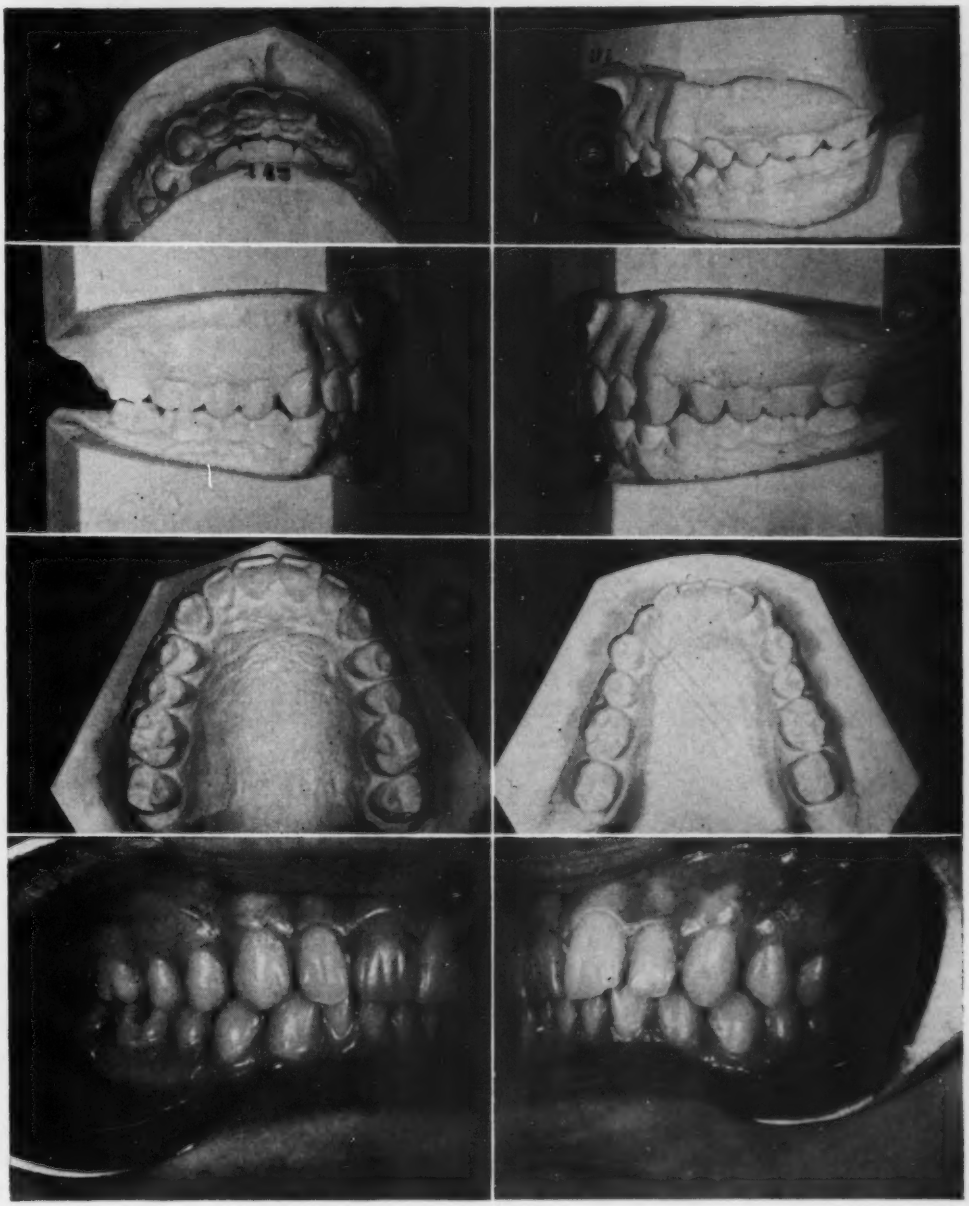


Fig. 14.—Case 3. Relapse of a treated Class II malocclusion, retreated after extraction of maxillary second molars. Finished casts and photographs eighteen months after treatment was completed show third molars in occlusion.

Case 3 (Fig. 14).—This is also a Class II, Division 1 case which had been treated previously. The original work apparently had produced a dual bite in spite of the use of extraoral anchorage. Although the boy could still bite forward with apparent ease, it could not

be assumed that he would ever do so regularly. The upper second molars were extracted and the upper lateral segments overdriven. Finished casts and intraoral photographs show the ideal and stable interlocking several months after all bands were removed.

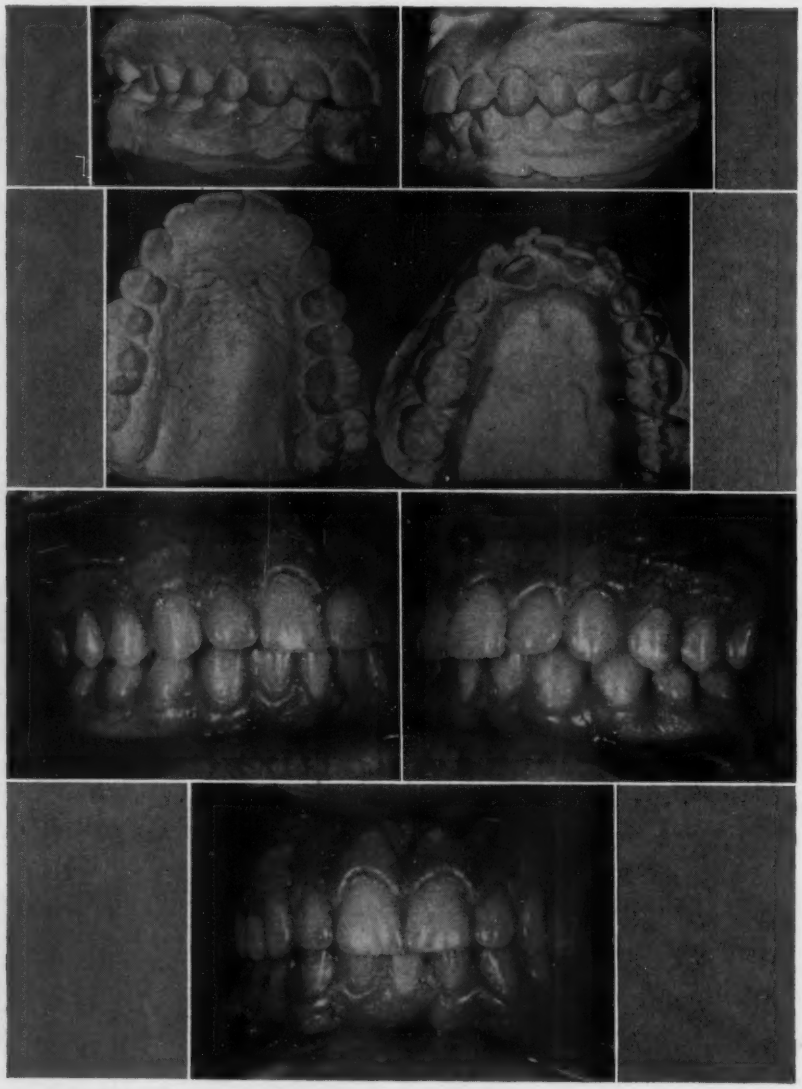


Fig. 15.—Case 4. Disharmony in size of upper and lower incisors. Treatment simplified by removing mandibular left central incisor.

CASE 4.—As a rather common example of disharmony in upper and lower incisal width, the casts in Fig. 15 exhibit a satisfactory posterior occlusion and marked crowding in the lower anterior region only. The lower left central incisor was removed. When at all feasible, it is preferable to extract a central incisor rather than a lateral incisor in a disharmony case such as this, even if it necessitates slightly more tooth movement, because it is usually somewhat narrower, thus favoring complete closure of the space. The appliance used in this instance was a lower twin arch with all five anterior teeth banded and, during most of the time, only an upper Hawley bite plane was used to decrease or at least to prevent any increase in the overbite. To gain additional resistance to tipping of the teeth

adjacent to the extraction space, the bands are fitted at a slight angle to the long axis of these two incisors. When the alignment of the five anterior teeth is completed, the bands are not all removed at one time. The two canine bands are left on and the incisors are ligated to the arch for one appointment. Then, after the canine bands have been removed, all five

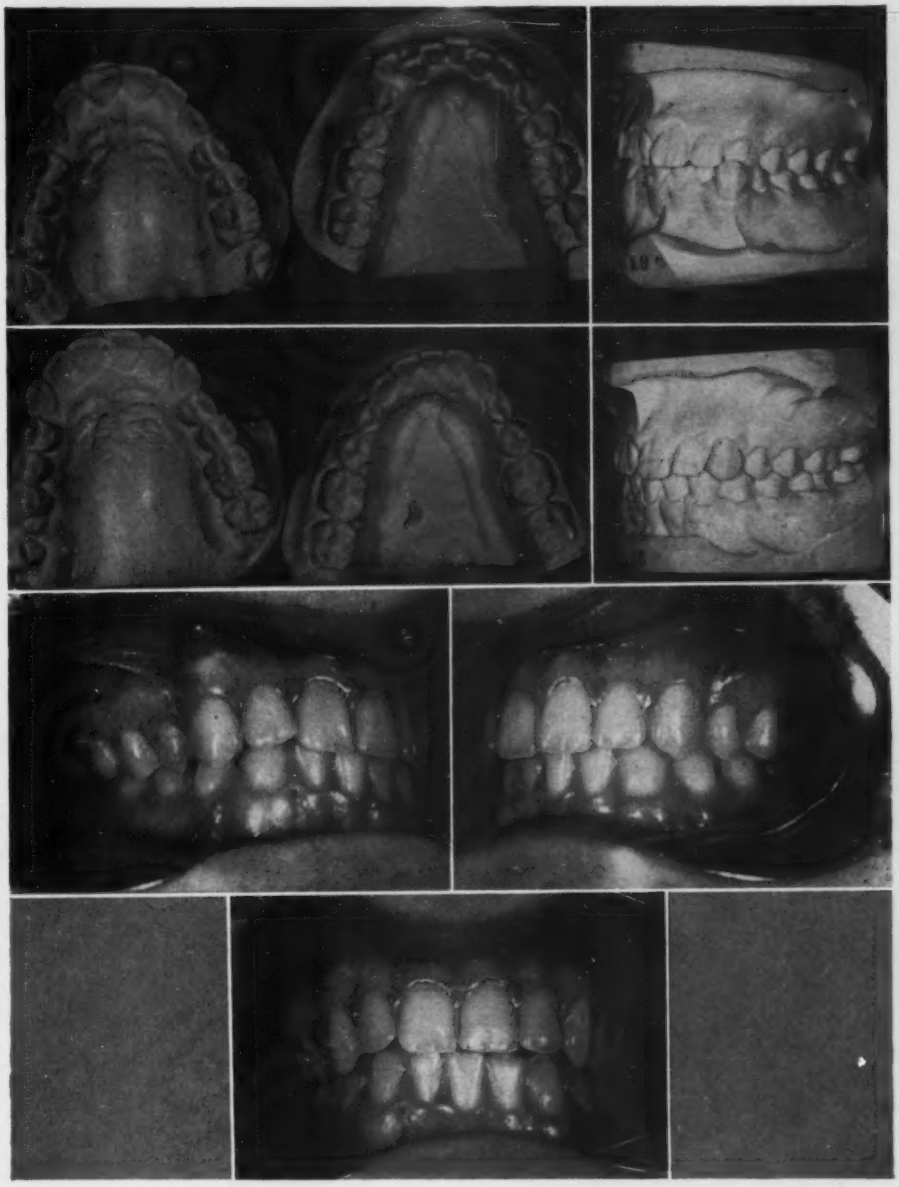


Fig. 16.—Case 5. Disharmony again in size of upper and lower incisors compensated for by extracting the lower left lateral incisor.

anterior teeth are ligated to the twin arch and intramaxillary elastic force is used to complete the closure of the spaces. This is a routine which is followed in these cases because of a tendency otherwise for the spaces left by the ten thicknesses of band material to consolidate at the extraction site. At times a canine-to-canine sectional labial arch is used as a retainer.

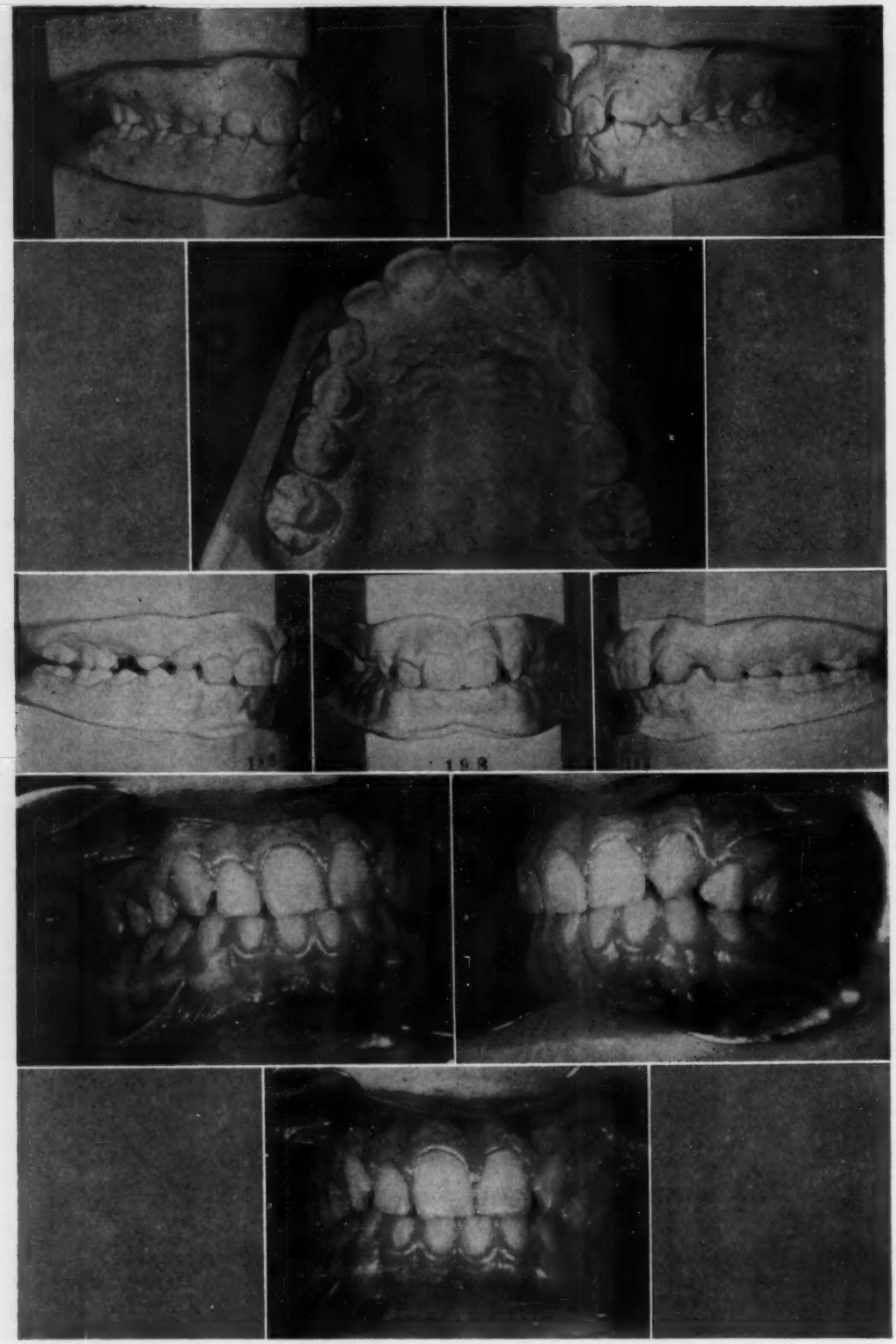


Fig. 17.—Case 6. Malocclusion resulting from twinned maxillary incisor treated as though it were a case with a unilateral congenitally missing lateral incisor. Treatment time was ten months; no retention was required.

CASE 5 (FIG. 16).—This is similar to the previous case except that, since the primary objective of treatment was to correct the labioversion of the lower left canine, it was deemed more expedient to remove the lower left lateral incisor. Both of these cases, very simple in nature, are shown merely to illustrate how well the width of one lower incisor approaches the measure of the existing disharmony. It will be noted that the posterior occlusion is no longer ideal but stability is obtained by equilibration.

CASE 6.—This case (Fig. 17) is unusual in that it presents a fused incisor in the upper left quadrant. When the patient was 8 years of age, at which time the original models were made, an attempt was made to separate the two halves of the fused tooth. This was unsuccessful because of an anastomosis of the nerve canals at the root ends. Nothing was done then for two years and the second set of casts shows the canine erupted in the space where the lateral incisor had been. A very short period of treatment (ten months), with only an upper twin arch most of the time, closed the space on the upper left side, and intraoral photographs taken a year apart after treatment was completed show that the result is stable. No retention was required.

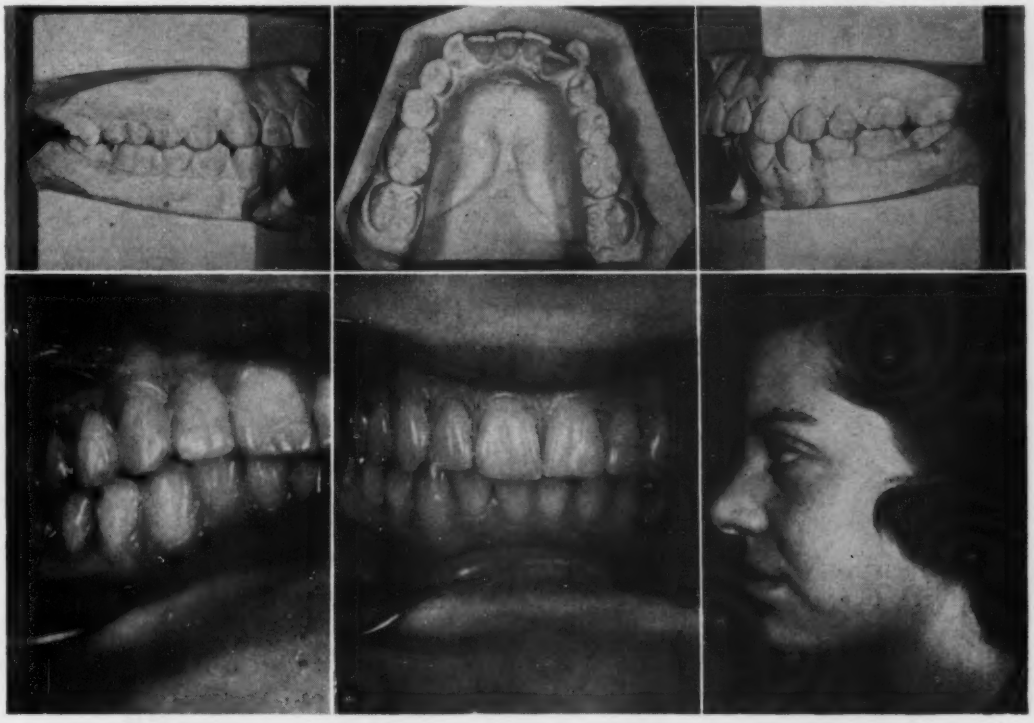


Fig. 18.—Case 7. Case in which upper and lower second molars on only the right side were removed. Intraoral photographs five years after treatment was completed.

CASE 7.—The casts in Fig. 18 represent the end result of two years of orthodontic treatment. By mutual consent, the parents and the orthodontist had agreed to discontinue treatment. The patient was then 14 years of age. The slight overjet still present caused the lower lip to curl under the upper incisors, and the lower incisors were far from straight. Unilateral extraction of the upper and lower right second molars provided not only the required room in the lower arch, but made it possible to obtain a normal interlocking of the two lateral segments and reduce the overjet. Treatment took thirteen months, but the second photograph taken five years after treatment was finished seems to justify this unique method of handling a problem case. The third molars are in functional occlusion without any correction.

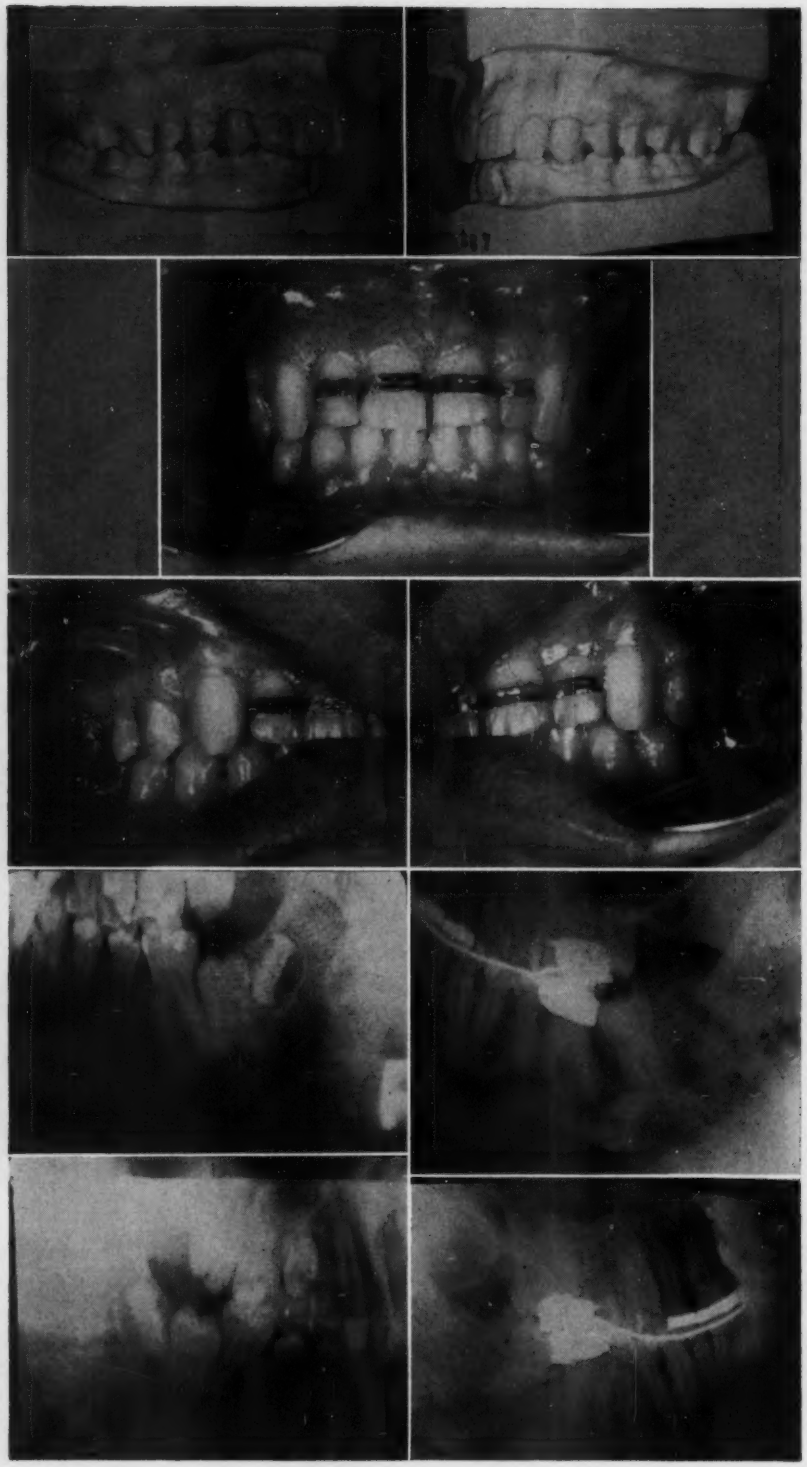


Fig. 19.—Case 8. Progress photographs of deep overbite case where four second molars were extracted. Note change of position of third molars in roentgenograms.

CASE 8 (FIG. 19).—The patient was a boy, aged 16 years. The casts show a Class II molar relationship with a deep overbite. This boy's older brother had been treated previously. Several years after retention had been discontinued in his case, some relapse due to loss of expanded arch width in both jaws had occurred. At that time the four third molars were extracted surgically and the case was retreated with fixed appliances followed by a Kesling positioner. The result at present—two years after the positioner was discontinued—is good and apparently stable. With this experience in mind, treatment for the

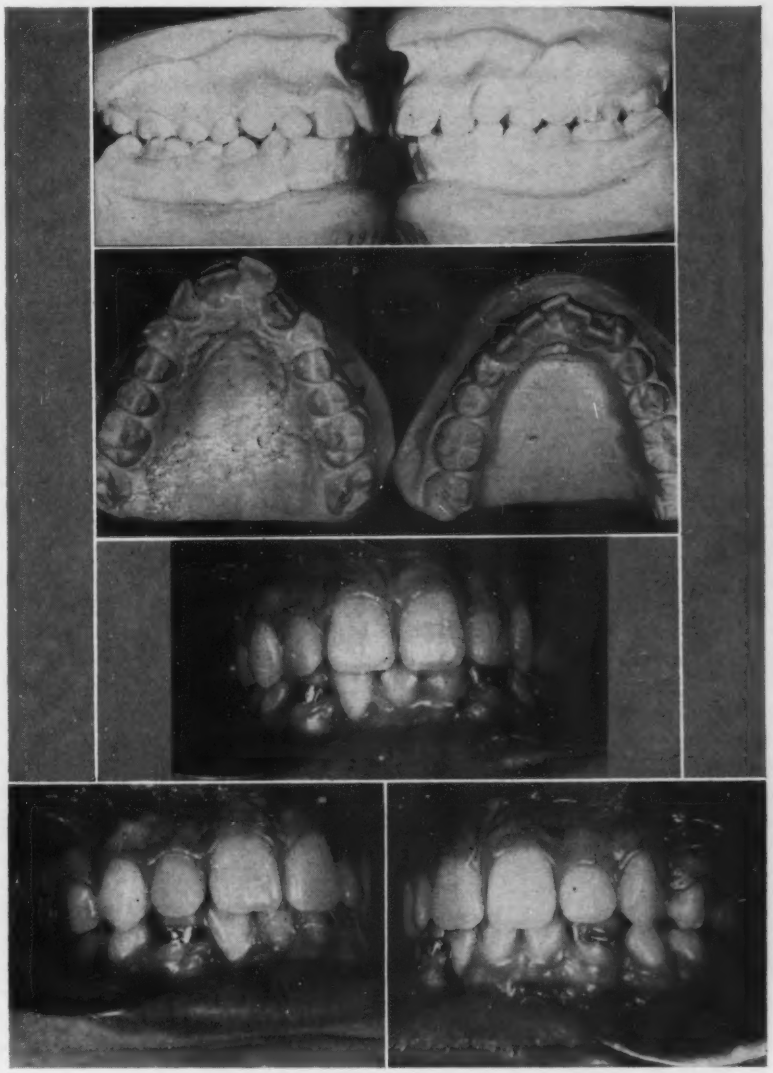


Fig. 20.—Case 9. Class I malocclusion. Extraction of upper premolars balanced by removal of one lower incisor.

younger brother was started with the stipulation that if, after a few months of active treatment, it seemed advisable to extract teeth, the four second molars would be removed. After three and one-half months of active treatment, it became apparent that, to obtain room to align the lower anterior teeth without producing too much procumbency, there would have to be some distal movement of the molars and premolars. This was the deciding factor and, since any distal movement of the lower molars would necessitate that much

additional distal driving of the upper molars, all four second molars were extracted. The position of the four third molars is shown in the x-ray picture. Photographs taken eighteen months later (with treatment still unfinished) show the corrected molar relationship, improved anterior alignment, and a much reduced anterior overbite. The upper third molars are in place in perfect alignment and recent x-ray pictures show the lower third molars in a favorable position for early eruption. The delay in making a final decision to remove second molars did not slow up treatment progress to any extent. It will be noted that the lower third molars are in a more upright position than the x-ray pictures taken at the time treatment was started, and especially the ones taken four years prior to that would lead one to expect.

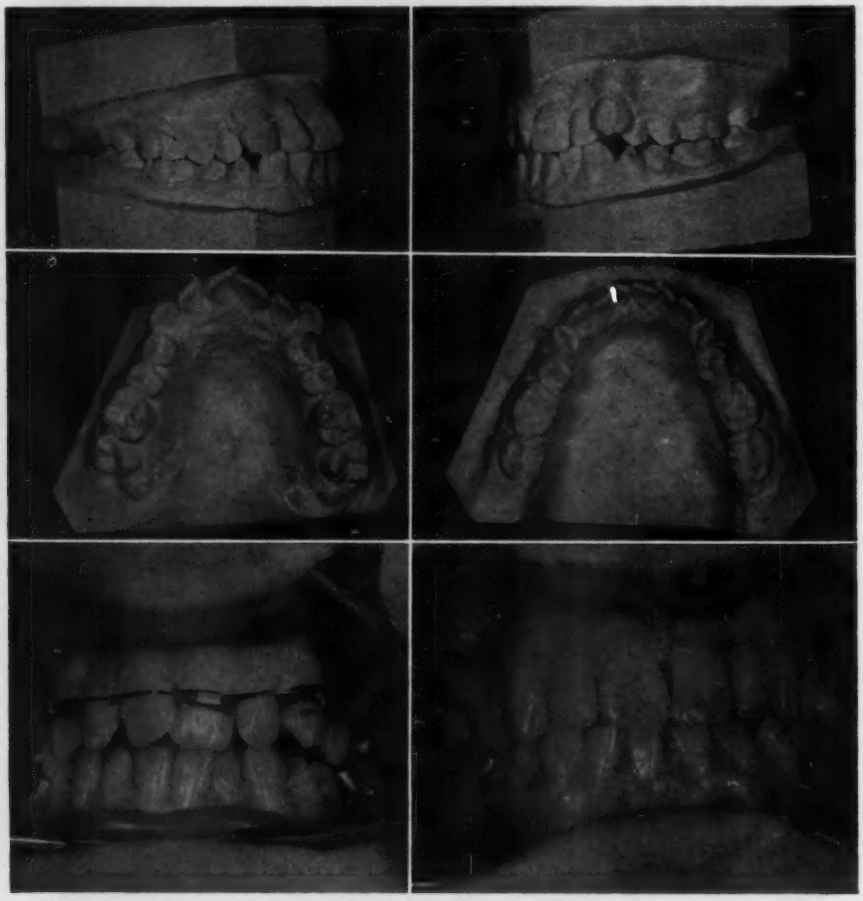


Fig. 21.—Case 10. Borderline case with tendency toward an open-bite. Result obtained by extracting upper left first premolar and lower left central incisor shown six years out of retention.

Case 9 (Fig. 20).—The casts of the patient, a 13½-year-old girl, present a Class I molar relationship with upper and lower anterior crowding. Since the patient was a small-boned person, and because of hereditary factors, this was apparently an extraction case. It was decided that two upper teeth would be extracted at the start of treatment and the spaces fairly well closed before extraction of lower teeth. The upper left first and the right second premolars were selected because it was evident that more mesial movement of the distal segment would be necessary on the right side. It is only logical to have the space

nearest to the teeth requiring the major movement. Six months later the lower right central incisor was removed. Two factors entered into this decision: first, the loss of that amount of tooth structure would be sufficient to obtain a correct positioning of the remaining anterior teeth and, second, this presumably would cut down treatment time which suddenly had become of extreme importance when the family received orders to an overseas duty station. Whether the result is as satisfactory as if lower premolars had been removed is subject to argument but, with no chance to supervise retention, this may be the better choice for this one case. Esthetics are satisfactory and treatment, which took fourteen months, barely met the deadline.

CASE 10 (FIG. 21).—This is the case of a girl, aged 15 years, with a slight amount of anterior crowding in both arches. With so little vertical overbite, conservative treatment without extraction, at least in my own opinion, is ruled out because of the tendency toward an open-bite. Any degree of expansion would be likely to produce this complication. Taking into account that the maxillary midline was slightly over to the right side, it was possible to expect that, with only the upper left first premolar sacrificed, the anterior teeth could be realigned with no increase in asymmetry, although it would merely be in the opposite direction. Since this much could be observed after a very few months of treatment, the final decision as to how to proceed from there on could be deferred. Since both dental arches were fairly wide and basal bone was quite plentiful, it was hoped that the esthetic result after the initial extraction would justify not having to remove the remaining three first premolars, but instead would balance the premolar loss above by one central incisor below. This was the eventual course followed. Treatment was short and the results six years after retention was discontinued show that, structurally, the case is in balance. Functionally, it is satisfactory and, as for the esthetics, the patient is primarily the judge.

CASE 11 (FIG. 22).—This case was treated in the clinic by a graduate student. This is another example of a delayed diagnosis. The reasoning was that, with the lack of room in both arches, some extractions were likely to be necessary. The upper right lateral incisor was so completely overlapped by the lower anterior teeth that correcting this relation would be difficult. The lower arch form was good, but the right second premolar was blocked out of line. Before any decision about extraction was made, the cross-bite of the central incisors was first corrected. At this point the amount of room needed in the upper arch could be more accurately gauged. After the parents had been given a complete explanation of all the pros and cons, the upper right lateral incisor was extracted along with the lower malposed premolar. Closing these small spaces was no problem; the original occlusion on the left side was undisturbed and the result is comparable to a case involving a congenitally missing lateral incisor—not ideal but individually appropriate for this patient.

APPLICATION TO MINIMAL TREATMENT

In each of the foregoing cases, the treatment followed was a matter of choice. Economic factors did not enter into the diagnosis. In these times, when our Government is giving more and more attention to the health needs of the entire population, it is essential for our profession to give some thought not only to preventive orthodontics, but also to minimal treatment. The need for both of these services is emphasized by contact with an orthodontic clinic where there is an unbelievable demand for both. Cases which most need treatment are also likely to require extraction. The atypical extractions outlined in this article are ideally adaptable to minimal treatment, for in these cases structural balance and function can be obtained in short order while the esthetic effect must be judged by comparison, not with the ideal but with what the patient

now has and might otherwise have to be content with. The cases which follow illustrate the application of atypical extractions in the treatment of four deserving youngsters for whom optimal care, even in a clinic, was out of the question.

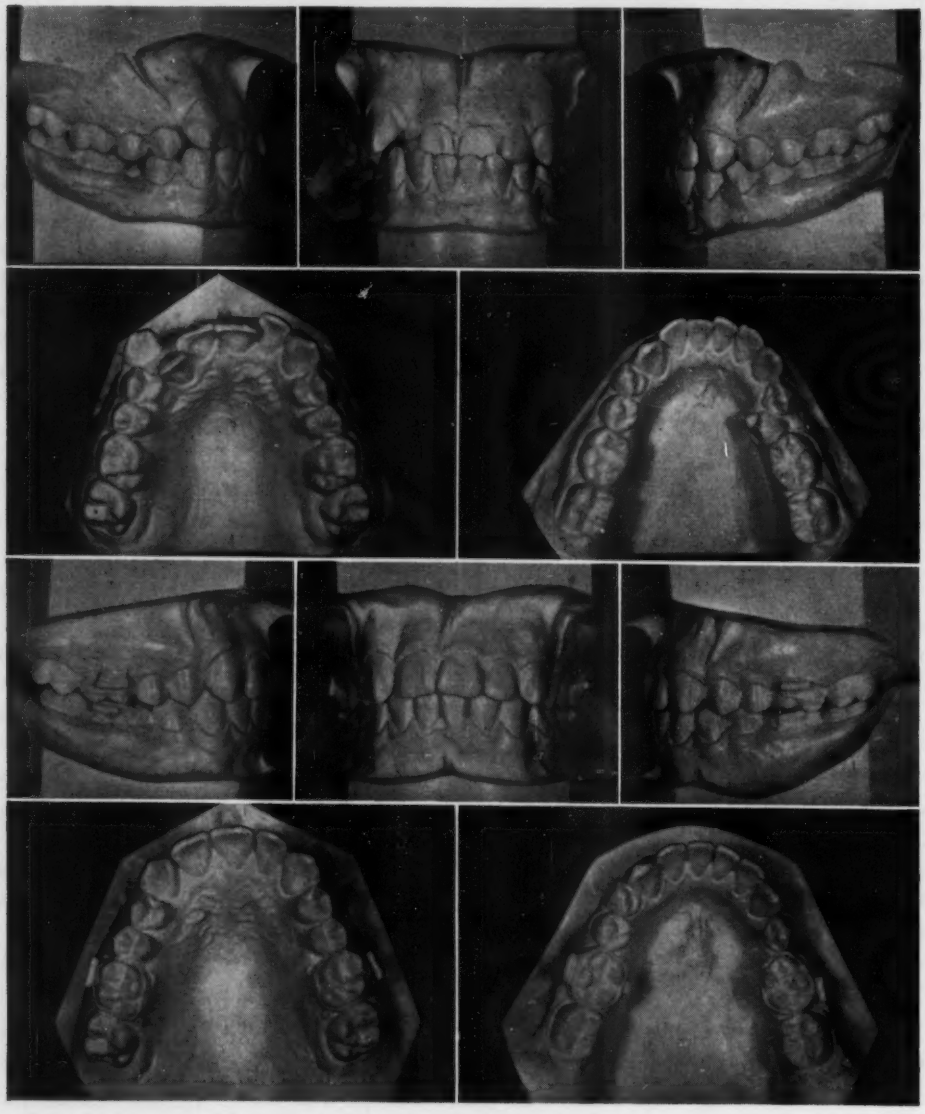


Fig. 22.—Case 11. Class I malocclusion with anterior cross-bite. Casts before treatment and after unilateral extraction of maxillary lateral incisor and mandibular second premolar.

Case 1.—The dental casts shown in Fig. 23 are those of a girl aged 11 years, with a neutroclusion, an upper lateral incisor in linguoversion and completely overlapped by the lower opponents, plus the complication of a twinned lower incisor and hypoplastic enamel. All that was done was removal of the upper lingually posed incisor and closing of the slight space thus created. This satisfied the structural and functional needs of the patient and actually met her appearance requirements quite adequately.

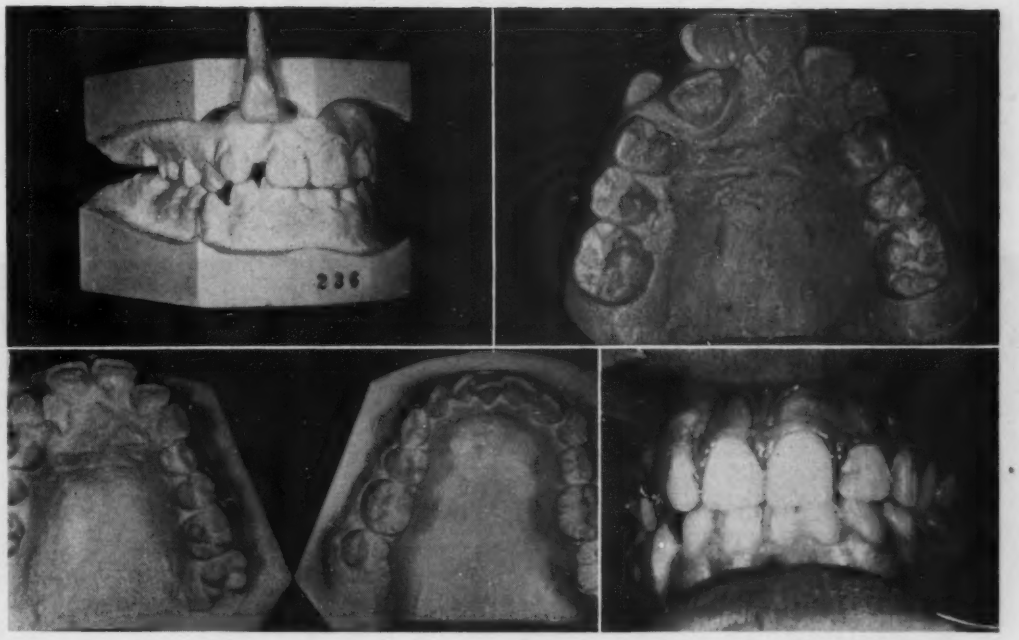


Fig. 23.—Minimal treatment involved removal of lingually locked incisor and closing of space.

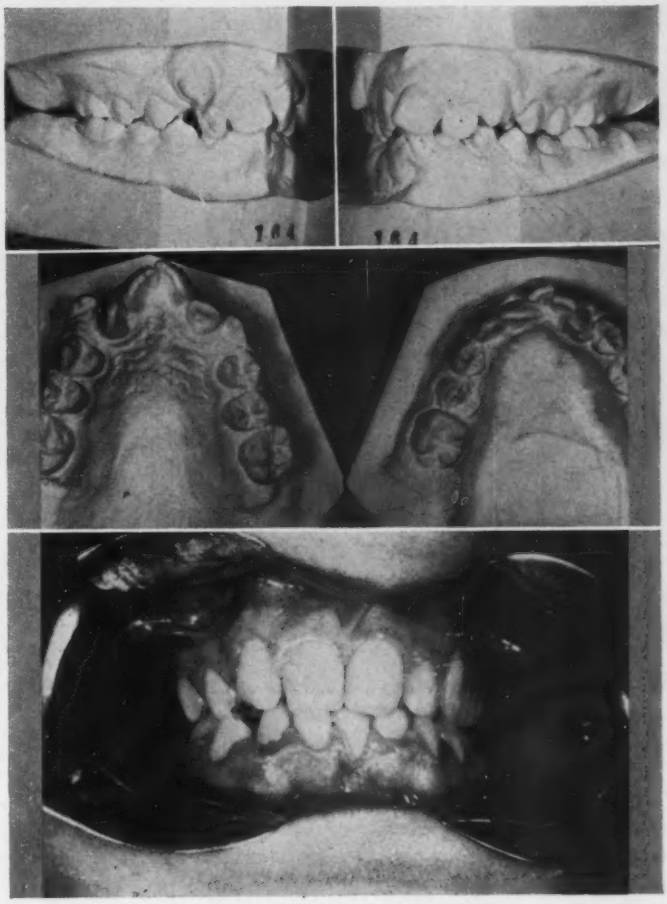


Fig. 24.—Minimal treatment again involved compensating for a previously extracted mandibular incisor with the sacrifice of maxillary right lateral incisor.

CASE 2 (FIG. 24).—Economics again dictated procedure in dealing with this 12-year-old girl's problem. The molar relation was normal. One lower incisor had been extracted by her dentist because it was so far out of line. The upper right lateral incisor was badly rotated and, by extracting it, room was provided for rotating the other three incisors without extensive treatment and the missing tooth in the mandibular arch was balanced.

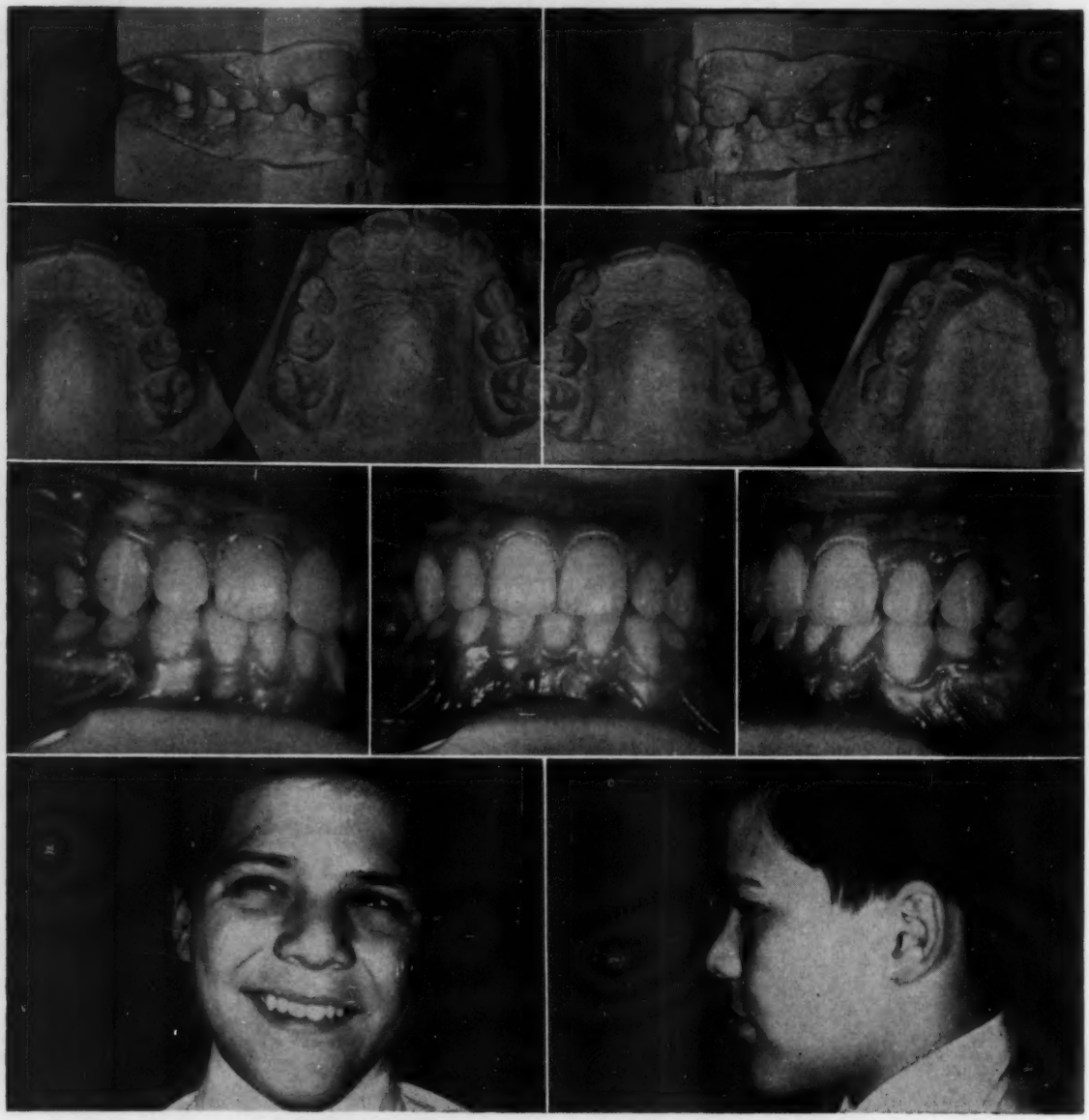


Fig. 25.—Serial extraction and simple treatment, which involved removal of upper premolars and lower left lateral incisor, produced functional result and very satisfactory esthetics.

CASE 3 (FIG. 25).—At the age of 8 this boy, as shown by the original casts, had two upper lateral incisors and the lower left lateral incisor fairly well blocked out of line. Primary treatment was instituted to obtain increased arch width, but it became apparent after a few months that sufficient room could not be made to accommodate a full complement of teeth. Thus, the maxillary deciduous canines were extracted to allow the lateral

incisors to erupt. The comparative arch form of the original upper and the same arch at the time when the lateral incisors had been aligned are shown in the center photographs. This treatment took one year. Observation was so planned as to intercept and remove the first premolars above as soon as they erupted. The lingually posed lower incisor was also extracted at this time and six months of twin arch therapy produced the results shown. The face is well balanced and, esthetically and structurally, the denture is satisfactory.

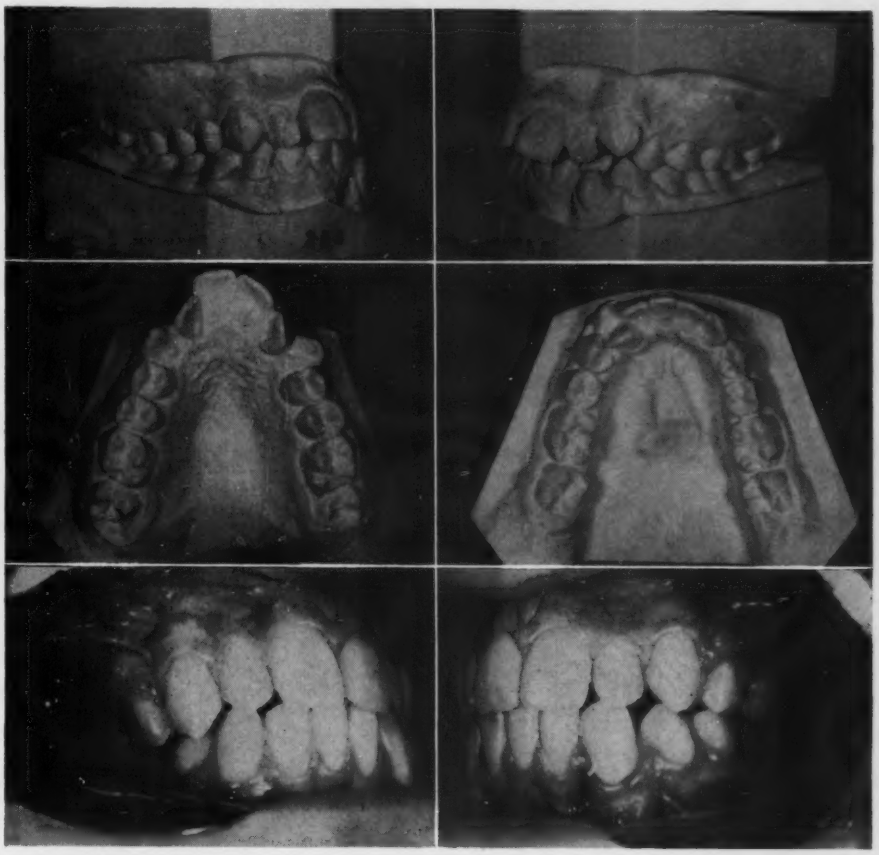


Fig. 26.—Mandibular left lateral incisor was extracted in this case to balance extraction of premolars in upper arch and shorten treatment time.

CASE 4 (FIG. 26).—This is neutroclusion case in a boy, aged 13 years. Again circumstances dictated minimal treatment. The upper arch was narrow and supporting basal bone did not seem adequate for retention of all the teeth. The upper first premolars and the lower left lateral incisor were removed. Lower arch form, discounting the one incisor in linguoversion, was almost ideal and practically no appliance therapy was needed. The upper spaces were closed with a lingual arch and finger springs, followed by a twin arch and intramaxillary elastics. Although this did require seventeen months, appointments were widely spaced and the treatment could aptly be termed minimal.

SUMMARY

The cases presented are fairly representative of the application of atypical extractions in treatment. These cases have not been of any particular type, nor would this therapy fit any *type* of malocclusion. It is only hoped that in an

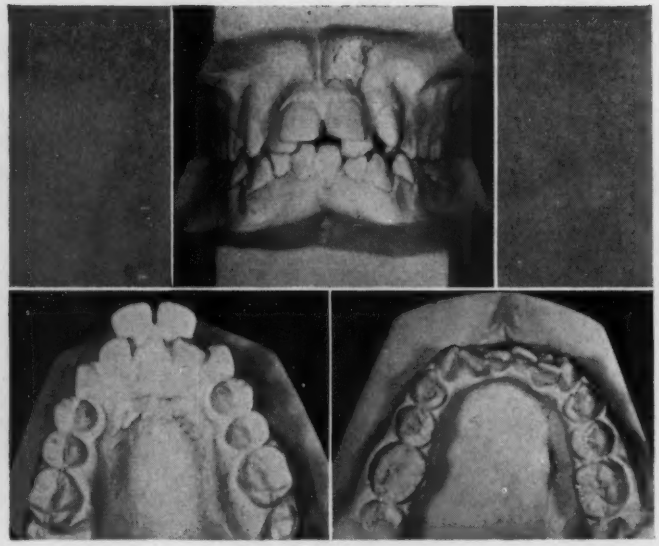


Fig. 27.—Gingival recession on lower incisor should influence decision about extraction in this case.

Fig. 28.—Fate of impacted mandibular second molar when premolars were removed in Class II malocclusion and the first molar was moved mesially. This possibility was overlooked at the time the diagnosis was made.

occasional selected case where the retention of a full complement of teeth either seems impossible or proves to be impossible, this undeniably individual selection of teeth to remove will be weighed against conventional earmarking of premolars and found more expedient.

This approach to the extraction phase of diagnosis will obviously lend itself to no popular philosophy of treatment. From my short teaching experience, I know that it will have none of the appeal that goes with the concise step-by-step treatment planning that accompanies edgewise analysis of cases involving extraction of four premolars. When the time comes that results achieved always match expectation, there will be no need for as flexible an outlook as has been presented here. Until that time, it may be not only helpful, but fundamental, to consider the individual aspects of every case as being foes to conformity. With alternative units to consider for extraction, and combinations of them to be made to fit special problems, and even latitude in the timing of the decision to extract, there is less tendency to hurry into a final diagnosis which, if it involves the loss of four teeth, may lead to failure. A concept which does not allow for an individualistic approach can lead to such easily avoidable errors as these.

In the first case (Fig. 27) the existing gingival recession around the lower central incisor was overlooked. Since it was obviously an extraction case, four premolars were removed. This patient was treated in our clinic at school and the recession progressed during treatment to an alarming degree. Here is an example of an individual factor which should have led to a different decision as to the selection of extraction units in the mandibular arch. With noticeably less crowding below than in the maxilla, removal of the one affected incisor might easily have provided the necessary room and eliminated the periodontal problem.

A similar adherence to routine was evident in the second instance (Fig. 28) with its inevitable aftermath. Existence of the second molar impaction at the time of diagnosis failed to influence the decision. As it happened, the first molar was moved mesially during the process of closing premolar extraction spaces in the lower arch and, unfortunately for the orthodontist involved, the second x-ray picture was taken by the patient's grandfather.

There was nothing unusual about either of these cases. The results obtained would have been acceptable except for the specific factors which should have been taken into account. As it was, these cases were fitted to the treatment philosophy. In orthodontics this is the cardinal sin.

Medical Arts Bldg.

THE GROWTH IN WIDTH OF THE FACIAL SKELETON

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INTRODUCTION

ELSEWHERE[3, 4] it has been postulated that growth of the facial skeleton in the anteroposterior and vertical directions during fetal life and early childhood is regulated by the cartilage of the nasal capsule and of the mandibular condyles. Growth of the nasal capsule, and especially of the septal cartilage, thrusts the facial bones, including the maxilla, downward and forward and permits growth to take place at the facial sutures, which have been classified into two suture systems, namely, the retromaxillary and the craniofacial systems. This type of growth at the sutures becomes less active after the establishment of the deciduous dentition, and ceases soon after 7 years of age with the beginning of the functional life of the permanent dentition. After this time, growth is by surface deposition and absorption, except in the case of the mandible, in which the condylar growth cartilages remain active until the onset of adult life.

In this article the mechanisms and sites concerned in the growth of the facial skeleton in width are analyzed.

THE CRANIOFACIAL SKELETON AT BIRTH

When viewed from the anterior aspect (norma frontalis), the skull of the newborn child (Fig. 1) shows the presence of a complete sagittal suture system dividing the cranium and face into two halves. The sutures making up this system are (1) the metopic suture separating the frontal bones, (2) the internasal suture between the nasal bones, (3) the intermaxillary suture which extends along the middle line of the hard palate as the midpalatal suture, and (4) the mandibular symphysis. This sagittal suture system does not, however, bisect the whole skull. The interior of the skull is rendered somewhat complicated by the presence of the midline cranial base. This structure, which extends from the foramen magnum to nasion (where the nasal and frontal bones meet between the eyes at the root of the nose), is made up, from back to front, of the body of the occipital bone, the body and lesser wings of the sphenoid bone, the mesethmoid bone (perpendicular plate of the ethmoid), and the interorbital part of the frontal bone. From the foramen magnum to the foramen caecum (at the anterior end of the mesethmoid), the midline cranial base is preformed in cartilage and is continuous in

From the Anatomy Department, Queen's University.

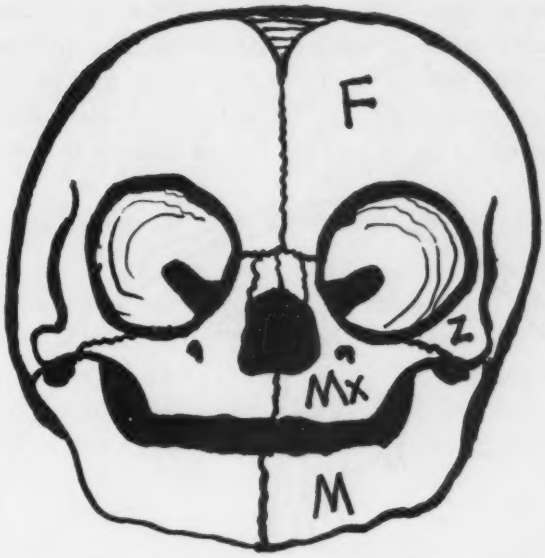

Fig. 1.—The skull at birth showing the midline sagittal suture system.

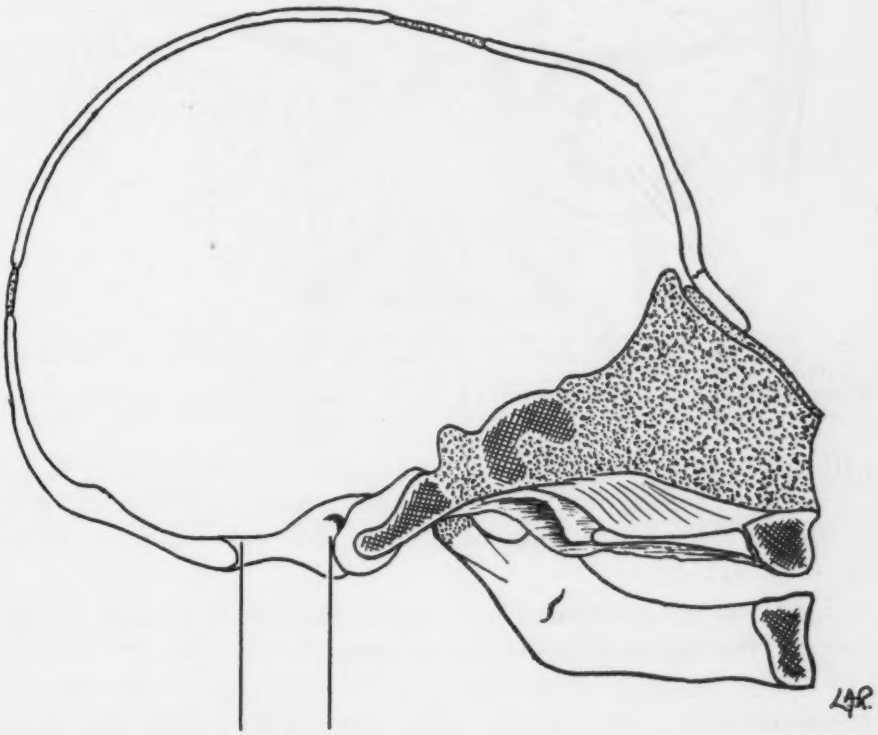

Fig. 2.—Sagittal section showing the cartilage of the midline cranial base and nasal septum. Ossification centers are developing for the basioccipital and spheniod bones. (From Scott: AM. J. ORTHODONTICS, June, 1954.)

front with the cartilage of the nasal septum (Fig. 2). In the cartilage, the ossification centers for the basioccipital (occipital body), postsphenoid, presphenoid, and mesethmoid develop. At birth the postsphenoid and presphenoid centers have united to form the body of the sphenoid, which is separated from the basioccipital by the spheno-occipital synchondrosis. This synchondrosis remains as an important site of growth in the cranial base until

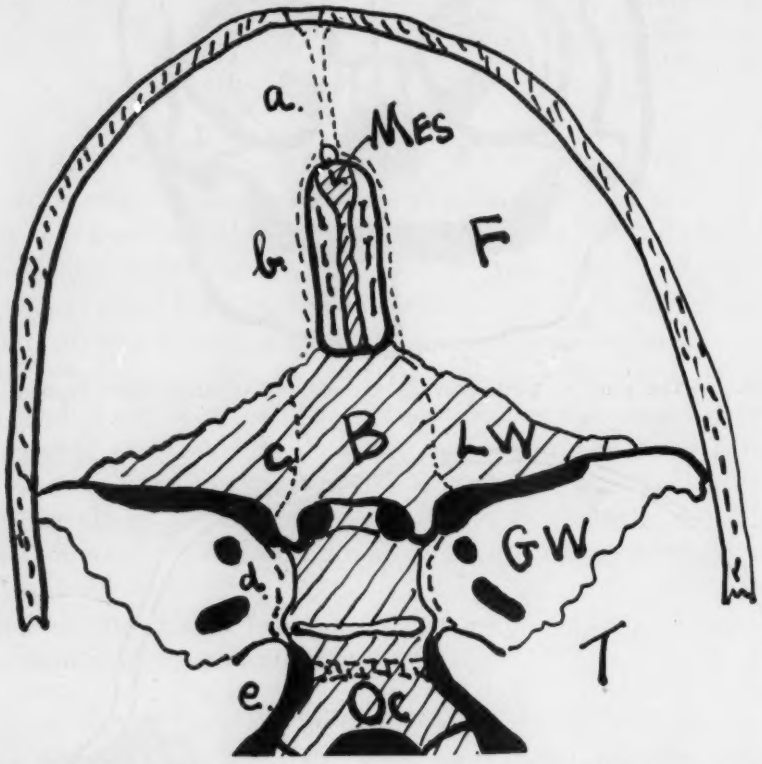

Fig. 3.—Cranial base showing the relationship of the midsagittal suture system (dotted lines) to the midline cranial base (cross hatching). *a*, *b*, *c*, *d*, and *e* are the parts of the suture system referred to in the text.

F, Frontal bone; *Mes*, mesethmoid; *LW*, lesser wing of sphenoid; *B*, body of sphenoid; *GW*, greater wing of sphenoid; *T*, temporal bone; *Oc*, body of occipital bone (basioccipital).

adult life. The mesethmoid commences to ossify shortly after birth. At the base of the skull the sagittal suture system divides so as to run on either side of the midline cranial base; it is made up of the following parts, from front to back (Fig. 3):

(1) The metopic frontal suture as far back as the foramen caecum.

(2) The region of the cribriform plate.

(3) At the back of the orbital cavities the body of the sphenoid forms the medial walls of each cavity beneath the outward-spreading lesser wings which form the roof of each orbital cavity.

(4) The greater wings of the sphenoid, which ossify in membrane, are separated from the body of the bone by an area of cartilage (Fig. 4).

(5) The temporal bones (petrous parts) are separated from the side of the body of the sphenoid and of the occipital bone by connective tissue and the jugular foramen.

Therefore, during fetal life and at the time of birth, the sagittal suture system is complete. It is the site of active growth and plays an important part in the growth in width of the craniofacial skeleton.

THE MECHANISM OF GROWTH IN THE SAGITTAL SUTURE SYSTEM

Separation of the sutures making up the sagittal suture system is produced by (1) growth of the brain and (2) growth of cartilage. Growth of the brain within its sheath of dura mater is the most important factor in the separation of the bones of the cranial vault. At the cranial base, however, the important element in growth regulation is the cartilage between the body and greater wings of the sphenoid (Fig. 4). In front of this the cartilage of

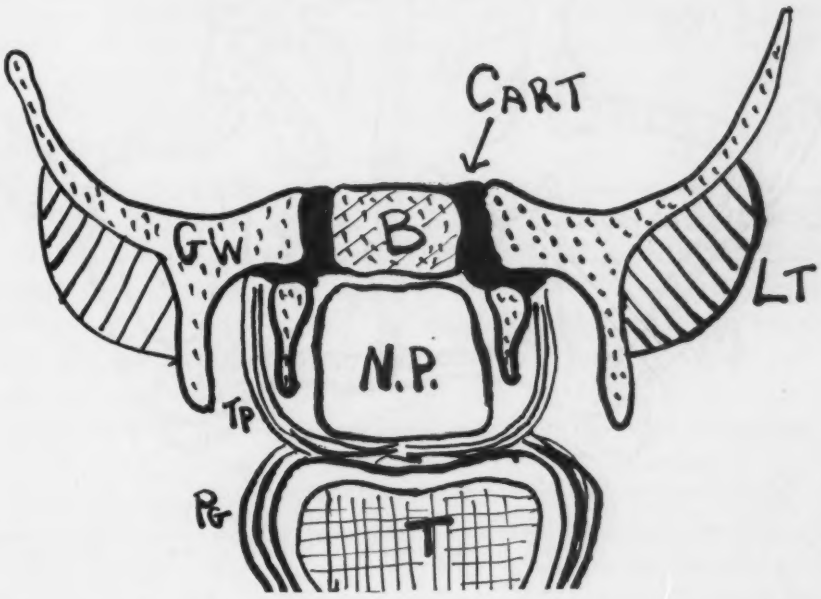

Fig. 4.—A transverse section through the body and great wings of the sphenoid to show the position of the bilateral growth cartilages (*cart.*).

B, Body of sphenoid; *GW*, greater wing of sphenoid; *T*, tongue below soft palate; *NP*, nasopharynx; *LT*, lateral pterygoid muscle; *TP*, tensor palati muscle; *PG*, palatoglossus muscle.

the cribriform plate and the roof of the nasal capsule plays a subsidiary role, and behind there is some cartilage between the temporal bones of each side and the occipitosphenoidal midline axis. In both of these regions, however, the cartilage is largely replaced by fibrous tissue during late fetal life. During the later part of fetal life, therefore, it is the bilateral cartilages uniting the greater wings of the sphenoid to the body which play the most active part in regulating growth in width between the eyes. Hypertelorism[1, 2] is a congenital condition which is thought to be due to abnormal growth in this region.

CHANGES IN THE SAGITTAL SUTURE SYSTEM

During the first year after birth important changes occur in the sagittal suture system. The metopic suture, in the vast majority of skulls, commences to unite so that the two halves of the frontal bone become continuous. At about the same time, the mandibular symphysis is obliterated and the lower jaw becomes a single bone. During the first year of life the greater wings become united to the body of the sphenoid. As a result of these changes, the greater part of the sagittal suture system becomes obliterated and the sphenoid, which occupies a key position in the regulation of craniofacial growth, becomes a single bone extending from one temporal fossa to the other. Soon

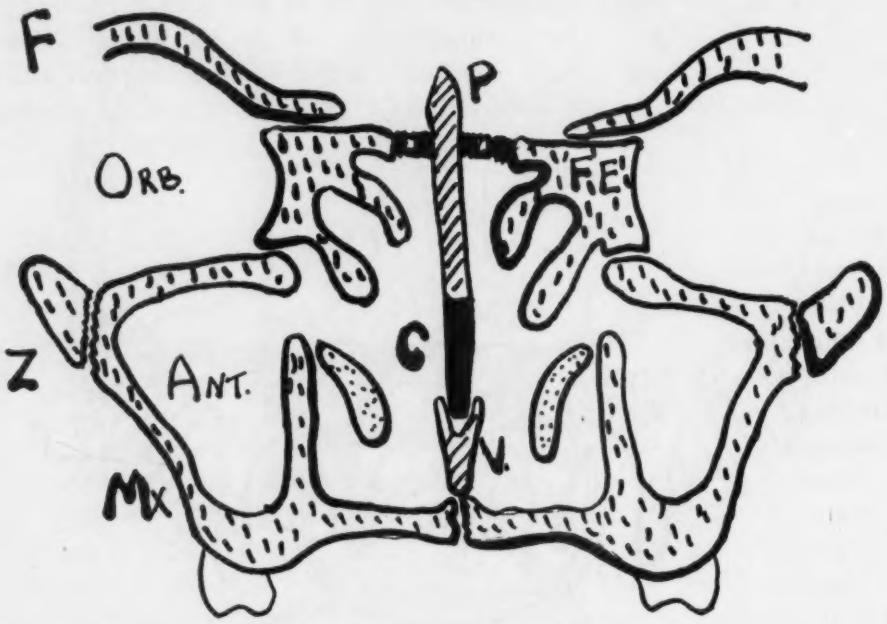

Fig. 5.—Transverse section through the upper facial skeleton.

Orb, Orbital cavity; *Ant*, maxillary antrum; *F*, frontal bone; *Z*, zygomatic bone; *Mx*, maxilla; *P*, perpendicular plate of ethmoid (mesethmoid); *C*, cartilage of nasal septum; *V*, vomer; *FE*, facial part of ethmoid which becomes united with the perpendicular plate by ossification of the cribriform plate.

afterward (by the third year) the cribriform plate ossifies from side to side, uniting the facial part of the ethmoid to the mesethmoid (perpendicular plate), so that the ethmoid bone becomes a single bony unit extending between one orbital cavity and the other (Fig. 5). By about the age of 3 years, the width between the eyes has reached adult dimensions. After these changes it is still possible (Fig. 5) for the maxilla to move laterally and it is possible for growth to take place at the suture between the maxilla and the zygomatic bone. Growth of the orbital contents, especially the eyeball, probably involves some outward growth of the zygomatic bone as this forms part of the lateral wall of the orbital cavity.

This growth of the orbital contents along with the forward and outward growth of the lower jaw acting through the articulation of the teeth may also

involve separation of the maxillary bones at the midpalatal suture. Growth of the eyeball, however, like that of the brain, is almost completed by the seventh year and there is no evidence of further separation of the maxillary bones after that period. During the later part of childhood (10 to 21 years) it would appear that growth in width of the upper facial skeleton, like growth in the anteroposterior and vertical dimensions, depends entirely on surface deposition on the facial, alveolar, and oropalatal surfaces of the bones, associated with absorption of bone in the lower part of the nasal cavity and maxillary sinuses.

SUMMARY

1. During fetal life, and until the first year after birth, growth in width of the craniofacial skeleton takes place at a midsagittal suture system.

2. The chief mechanism which separates the bones along this system is growth of the brain and of the cartilage between the body and the greater wings of the sphenoid.

3. During this time the maxillary bones with the bilateral facial parts of the ethmoid will separate from one another at the midpalatal suture below and the cribriform plate region above (Fig. 5). This lateral growth will involve an increase in the interocular distance and in the width of the upper part of each nasal cavity.

4. During the first year after birth, with the union of the two halves of the frontal bone and of the greater wings with the body of the sphenoid, the midline sagittal suture system ceases to be a site of growth and the middle (sphenoidal) part of the cranial base becomes stabilized. Shortly afterward, with the union of the facial parts of the ethmoid with the perpendicular plate, as a result of ossification of the cribriform plate, the interocular and upper nasal regions become stabilized.

5. Separation of the maxillary bones is still possible after about the third year, as is separation of the zygomatic from the maxillary bone. With completion of the growth of the orbital cavities between 7 and 10 years of age, however, further outward movement of the maxilla and zygomatic bones involving the sutures ceases and further growth of the upper facial skeleton takes place by surface deposition in association with internal resorption.

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Orthodontic Profiles

MARTIN DEWEY

THE world is a stage upon which each person plays a part, but only a very few qualify to play leading roles. Martin Dewey was one of the latter.

He was born in 1881 near Kingman, Kansas, where his family had settled after leaving their home near Dowagiac, Michigan, during the great migration which followed the Civil War. (In later years Dr. Dewey made it possible for his widowed mother to spend her summers in Michigan, when he purchased for her a home on the shores of Dewey Lake, near which the family had lived before moving to Kansas.)

Life was rugged on the Kansas plains during Dr. Dewey's youth. There were no farm price supports in those days, and it was plainly a constant battle to exist. That kind of environment helped to develop the tenacity of purpose and the desire to succeed which were to become so characteristic of Martin Dewey. Dr. Dewey's choice of a career was probably influenced by the fact that his father was a pioneer dentist.

In 1899, following completion of his preliminary college education at the Wichita (Kansas) Normal School, Dewey enrolled in the Keokuk (Iowa) Dental College. (This school later was consolidated with the University of Iowa.) Following his graduation in 1902, he entered one of the first classes of the Angle School of Orthodontia in St. Louis, Missouri. After completion of his studies under Dr. Angle, he was selected by the latter to teach in subsequent sessions of the Angle School. Dr. Dewey's connection with the Angle School did not require all of his time so, eager student that he was, he proceeded to earn an M.D. degree by attending medical school in St. Louis. He later discontinued his connection with the Angle School of Orthodontia and established a private practice of orthodontics in Kansas City, Missouri, at a time when the future of orthodontics was highly questionable.

He was a talented and experienced teacher, and it was not long until he became a member of the faculty of the Kansas City Dental School. In this role as faculty member, he soon gained recognition as a teacher, debater, and writer on subjects pertaining to dentistry. His reputation soon radiated and he became an international figure in dentistry.

It was at about this period in his career that Martin Dewey developed into a talented public speaker. He learned to gain and hold the attention of an audience; he attained confidence in himself; he knew full well what he wanted to say, and never was he at a loss for words to say it. In a word, he stood out as a talented man and teacher. Many were heard to observe, after listening

to Dr. Dewey in debate, that if he had chosen the profession of Blackstone for a career instead of dentistry, he undoubtedly would have become equally eminent. He was a stickler for facts as being the important thing in any situation; on this basis he later discussed many of the important issues of his profession, and his discussions always reflected clear thinking and an amazing fund of information.

While a member of the faculty of the Kansas City School, Dewey was instrumental in establishing a chapter (Delta Rho) of the Psi Omega dental fraternity. This proved to be not just a social organization, but a vigorous study club where every dental subject was reviewed and discussed, often more interestingly than in the classroom. The subject of orthodontics being his foremost interest, he usually channeled the discussion of nearly every collateral subject, be it biology, embryology, or other subjects, and managed to create a tie-in with an orthodontic application. As a result of the Dewey inspiration, several of the undergraduate students of that period later became specialists in orthodontics and contributed to the creation of orthodontics as a specialty.

There was never enough time to accomplish all that Dewey wanted to do; hence, he was seldom seen without a book under his arm for study. His photographic memory was as amazing as some of the modern exhibits seen on television today.

Time was limited for teaching orthodontics to undergraduate students; however, since the Angle indoctrination and the Angle School experience, Dewey's mind was on orthodontics and orthodontic teaching so some of his close friends and early students urged him to establish a special course for graduates in orthodontics. The first session of the Dewey School of Orthodontics was held at the Dental School in Kansas City, Missouri, in the summer of 1911. The school was successful; however, it was moved to Chicago, Illinois, in 1917 and then on to New York City two years later. This school continued to hold annual sessions under Dr. Dewey's personal supervision until his death in 1933. Many of the original orthodontists secured their basic training in this full-time ten-week course. The Dewey students soon organized an alumni group which held annual meetings for a number of years.

In reviewing the professional career of Martin Dewey, one is soon struck by the impact of a preponderance of evidence that here was not only one of the important pioneers of the orthodontic specialty but, in addition, one of the most brilliant and talented men in organized dentistry of all time. He not only served on an infinite number of important committees in organized dentistry, but he was elected president of the American Association of Orthodontists in 1922 and later served as president of the American Dental Association.

For seventeen years he served as editor of the INTERNATIONAL JOURNAL OF ORTHODONTIA (now known as the AMERICAN JOURNAL OF ORTHODONTICS), which Dr. Dewey and the late Dr. C. V. Mosby of the C. V. Mosby Publishing Company established in 1915. In the early years, it was difficult for the JOURNAL to survive, but Dr. Dewey's ever-active pen kept the pages filled and his spirit

of determination never failed. With the support of Dr. Mosby (even at considerable financial loss), there resulted a journal presently in its forty-third year) which has assembled the most complete record of orthodontic literature in existence today, and which is now the official publication of the American Association of Orthodontists and of all the component societies of the Association.

Dr. Dewey served as professor of orthodontics for short periods at the University of Iowa Dental Department, Chicago Dental College, and the New York College of Dental and Oral Surgery. At the latter, summer sessions of his school were held when he first moved to New York.

Dr. Dewey was the author of several textbooks, including, *Practical Orthodontics* and *Dental Anatomy;* he was coauthor, with Thompson, of *Comparative Dental Anatomy.* All are used as standard texts in many dental colleges even today.

This man, strangely enough, could and did quote Roberts' *Rules of Order* off the cuff as glibly as most of us can read it; he knew it from cover to cover. This made him an expert parliamentarian and a leader of professional groups.

A short time before his death Dr. Dewey began the publication of a journal entitled *Orthodontic Review,* which was designed as an open forum for the discussion and evaluation of current orthodontic literature. However, without his guiding hand the journal was discontinued.

This venture revealed another facet of his character. He was instinctively a critic, a quality which does not make for close friendships and often creates violent prejudices. The pages of *Orthodontic Review* gave him ample opportunity, without reservation, to comment and disapprove, and this he was amply able to do.

He was a constant student who was never a neutral or a follower. Either he knew the facts and had the ability to prove and present them or, if not, he sought additional knowledge in order to verify his views. He did not make assertions shrouded in doubt or on the basis of personal opinion. He contended that personal opinions are usually influenced by prejudice and that criticism of a personal opinion or of a theory that cannot be factually supported meets with prompt opposition. Air castles are quite sacred to the builders, even when built upon the sand, and when they tumble and fall the wrath of the builder is heaped upon the critic. Dr. Dewey often found himself an unpopular critic.

He commented that it was of little importance where or how one gained knowledge; the really important thing was whether or not one attained it and how he used it.

Dr. Dewey deplored the plan of some dental schools to abandon the teaching of certain subjects on the presumption that they were not essential in the practice of orthodontics. He thought that the curriculum should be enlarged and expanded, instead of curtailed, and that a more equal balance between technical instruction and the basic sciences was vitally necessary.

The fact that dentistry began as a mechanical "trade" has been its greatest handicap to becoming a profession, and Dr. Dewey sought to remove that handicap from orthodontics.

Dewey contended that one's professional education is never completed, that increased knowledge only widens the opportunity to gain more knowledge, and he thought that the practitioner who presumes to be a specialist (other than in name only) should have a comprehensive understanding of every phase of his profession. Due to this belief, Dewey was quick to oppose the

Martin Dewey, D.D.S., M.D., author, teacher, leader, and orthodontic pioneer.

"Arizona Orthodontic Law" since he felt that it limited education and, in reality, was an attempt to divorce orthodontics from dentistry. It was the hope of its sponsors that other states would enact similar laws and that eventually the practitioner would be forced to follow a certain system of treatment in order to qualify for a license. Fortunately, the law was promptly repealed. As Dr. Dewey pointed out, such a law would produce mechanical robots, rather than better orthodontists.

He noted that it was regrettable and most unfortunate that the birth of orthodontics was handicapped by the belief that in order to practice one must be adept in a mysterious mechanical art in which only a few could qualify. Malocclusion was recognized and mechanically treated with some rather vague and conflicting ideas of the many factors which might cause the anomalies. Mechanical appliances became the cure-all remedy although Dr. Dewey aften stressed the fact that the orthodontic problem is both a biologic and a mechanical one, and that an orthodontic appliance should always be considered as a necessary evil. Nevertheless, mechanics offered a field day to the gadget-minded practitioner and a very wide opportunity to develop and present personal theories. The perfect appliance was invented before the many factors necessary to the production of normalcy were discussed. Even today, mechanics presumes to dictate to Nature exactly what normalcy should be. Science, a word that is being used rather loosely, is being nudged to move over and give empiricism more room. When Dr. Dewey died a vacancy was created which has never been filled. The forum of debate was his delight—not as a place to discomfort his opponent, as some presume to believe, but rather as a means to find and establish a truth. "Science," he remarked, "knows no friendship." During the past twenty-four years it has been apparent that the profession misses his guiding influence and his keenness to detect the flaws and to help erase them.

He believed that a philosophy was, in fact, a truth and never a child of fantasy; that truth does not just occur to support a theory, but that it must precede it. Nothing could be termed a truth if it were in opposition to normalcy in the cycle of growth and development, as we now understand it in life.

In the beginning of what is now termed the modern era of orthodontics there was a growing tendency to secure patents on appliances and gain profits through royalties. This again brought prompt and forceful opposition from Dr. Dewey, who contended that the public needed protection since it eventually paid the extra costs.

On the same principle, he was one of the most active workers in the Dental Protective Organization in the court fight over the "Cast Inlay Episode" when an attempt was made to blackmail the dental profession. He was thirty years ahead of his time in pointing out that the dental profession was losing command if it failed to supervise the commercial dental laboratories; he contended that the laboratories eventually would dictate to the dentist on construction and diagnosis of all prosthetic restorations and finally, through enactment of laws, they could practice "mechanical" dentistry without the aid of the general practitioner. That prophecy is rapidly coming to pass.

Dr. Dewey's foremost asset was his ability to teach. He had the knack (which few teachers possess) of instilling into his students a desire to find out more about the subject under discussion. His objective was to present a broad outline and give the student an opportunity to think. He was of the opinion that it was important to create interest wherein the student would

ask "Why?" instead of accepting everything as factual. It appears that his methods were quite effective, as a majority of his students progressed far beyond their postgraduate days.

There has always been some opposition to the short postgraduate courses; however, it is doubtful if any of the longer courses available today are an improvement over the original Dewey School after it was moved to New York. He had an unlimited source of talent in that area for special lectures in the medical and dental fields, as well as in all the allied fields. His school compared, in some degree, to preceptorship and apprenticeship training on an intensive level. The total number of lecture hours and the hours of technical training equaled and probably exceeded some of the longer courses. Under his personal guidance, his school system really functioned.

Dr. Dewey was one of the first seven men selected to serve on the American Board of Orthodontics when it was established in 1929. This Board has been most effective in raising the standard of qualifications for the practice of orthodontics.

As to recreation, game bird hunting was his real hobby. He kept several good hunting dogs in Georgia, where he frequently hunted quail in season; however, when time permitted, he enjoyed hunting duck on the Gulf Coast or prairie chicken and pheasant in the Midwest. He was an excellent shot; in fact, he was an expert. When asked why he seldom missed, he replied simply, "I don't shoot until I get my gun on the bird." He applied this same method on the lecture platform or in debate. His reserved manner was considered unfriendly by many, even by his associates of many years. Dewey kept himself so busy that he had little time for chitchat and backslapping. If he was glad to see you he would simply say "Hello" and on occasion call you by name. Although he did not smoke or drink, he was the ideal host in his home or on his boat. Those who were privileged to make long automobile trips with him or to join him on frequent hunting journeys were surprised to find an entirely different personality. If there were only two or three in the party he lost his reserved manner, became jovial, and talked constantly, entertainingly, and most interestingly on any topic from astronomy or geology to mumble-peg, sleight-of-hand, or amateur magic. He enjoyed the companionship of the late Dr. Oscar Busby of Texas, who had few equals as a wit in a crowd but who was at the same time a serious and intelligent speaker in a small group discussion.

It is a well-known fact that there are actually hundreds of orthodontic appliances constructed by commercial laboratories for each one that is designed and constructed by a competent orthodontist. The only diagnosis available to the laboratory technician is a plaster cast. Dewey frequently pointed out that the only way to combat this routine was to provide a better and more comprehensive understanding of orthodontics for the undergraduates and to make a greater effort to educate the public in all phases of dentistry.

Dr. Dewey's failure to get the American Dental Association to accept and sponsor his national advertising program, during his administration as

president, was probably the greatest regret of his professional life. The great effort and work that he put into the plan, the necessary travel to all sections of the country, and the many addresses he made upon the project (at a time when he was not physically able to do so), probably contributed to his last illness. The sad and ironic part is that the plan would not have cost the American Dental Association a single cent, although the Association would have had complete supervision of all the published material. The plan would have been handled in much the same manner as presently followed by the American Medical Association, whereby the drug manufacturers, insurance companies, and all who are vitally interested in better health are willing to cooperate and finance the project. Once again Dewey was ahead of his time and, one might add, ahead of his profession.

Even a brief summation of the professional career of this remarkable personality shows that he was a credit to his profession, that he left it progressively better than when he entered it, and that as a dental educator he had few equals and no superiors. It should be mentioned that on the night of his death, the news was carried on the large moving electric tape atop the Times Building in New York City's Times Square. The press was well aware of his prominence in his profession and of the fact that he was one of the foremost educators of his time. It was a final and fitting salute, well deserved and fully merited by the former farmboy for his rather long, yet meteoric, trip from Kansas to the "Lights of Broadway."

Paul G. Spencer
(with the collaboration of
William E. Flesher and
William B. Stevenson)

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In Memoriam

CARL OSCAR ENGSTROM
1884-1956

CARL OSCAR ENGSTROM died on June 30, 1956, in Santa Cruz, California. He had retired in 1955 and moved to Santa Cruz because of ill health, but continued to hope that he might complete fifty years of practice.

He was born in Sacramento, California, on Nov. 6, 1884, the son of Frederick Emil and Hanna (Pearson) Engstrom. He married Anna Verena Osborn on July 28, 1935; she served as his dental assistant until his retirement.

Dr. Engstrom received his dental degree in 1907 at the University of Southern California and immediately located in Sacramento. While in college he had become interested in orthodontics; this interest finally led him, in 1911, to attend the Angle School of Orthodontia in New London, Connecticut. He returned to Sacramento and was the first in that city to limit his practice.

In college he was a member of Omicron Kappa Upsilon and Delta Sigma Delta. Later he belonged to the American Association for the Advancement of Science, the First International Orthodontic Congress (held in New York in 1926), the Masons, and the Shriners.

Dr. Engstrom participated in organizing the Pacific Coast Society of Orthodontists, and served as its secretary for a long period. He later became one of its early presidents. He was editor of the Society's *Bulletin* for a number of years prior to 1932.

His inclination as a perfectionist was carried over into his work as an orthodontist; he was considered by his colleagues as one with real ability. He gave special attention to systematic case history records which became widely known throughout the country and with which he always attempted to indoctrinate younger practitioners.

As no history of the Pacific Coast Society had ever been compiled, Dr. Engstrom was appointed by the then President Blake to develop one, a task which he accepted graciously but with skepticism. He realized the difficulties to be encountered in unearthing early historical facts with so many of the older men no longer here. In later occasional meetings, he would report progress but again emphasize the difficulties of the task. The present status of the history, now interrupted, is not known.

Adapted from the *Bulletin* of the Pacific Coast Society of Orthodontics.

Although, for the most part, a serious and quiet type, Dr. Engstrom had his lighter side, with a good sense of humor and a capacity for enjoying and exchanging many a yarn with confreres. He was highly esteemed by all who knew him.

In addition to his widow, he is survived by a sister, Hulda Green of Imola; and two brothers, Armand Engstrom of Berkeley and Dr. Theodore Engstrom of Los Angeles, California.

Arthur D. Osborn (nephew)
James D. McCoy
William W. Leslie
William S. Parker
Reuben L. Blake

Department of Orthodontic Abstracts and Reviews

Edited by
DR. J. A. SALZMANN, NEW YORK CITY

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Foregangare Till Den S. K. Serieextraktionen (Predecessors of Serial Extraction). By Filip Palsson. *Odontol. Rev.* **7**: 118-135, January, 1956.

Orthodontists are aware that throughout history extraction of one or more irregular teeth was virtually the only means of improving the appearance of the permanent dentition. Not so well known is that various attempts also were made to establish a preliminary program of serial extraction in the mixed dentition. Both the early efforts and current procedures have had the same goal: the removal of certain deciduous and permanent teeth in deficient arches so that the remaining unerupted teeth can assume pleasing positions with functionally acceptable occlusal relations.

Palsson traces the early attempts back to the eighteenth century. Robert Bunon, a Frenchman, apparently was the first author to describe a method of removal of deciduous teeth to make "ready a comfortable place" for the permanent teeth. Bunon continues that "it is better to have one or two teeth less in each jaw, provided it can be compensated by a suitable arrangement, than to have the entire set of teeth poorly arranged and ill at ease. . . . By sacrificing the (deciduous) canine teeth to the incisors and the small molars (bicuspids) to the (permanent) canines, it will be possible to leave free space to make for themselves an attractive arrangement." This was written in 1743 in Bunon's *Essay on Diseases of the Teeth,* under the heading of "Measures To Procure for the Teeth a Convenient Arrangement at the Time of Their Renewal."

In England, Joseph Fox continues in the same vein in a text published in 1814: "In any of these [discrepancy] cases the removal of the temporary cuspids is absolutely necessary, and unless the operation be timely performed, the irregularity is with difficulty remedied. . . . When the incisores are perfectly regular, and the bicuspides have appeared before the cuspidati, there is so little space left that the cuspids are thrust too forward. . . . Therefore it will be right to extract the first bicuspis on each side. The cuspids will then fall into circle, and if there should be any vacant space, it will be so far back, that no defect will be perceived."

Palsson gives equal credit to his Swedish predecessor, Fougelberg, who wrote in 1852 that if "the outer front teeth infringe on the centermost ones, both milk canine teeth ought to be removed. . . . The 'pointed teeth' are easily felt in the mouth on both sides through the swollen gums. . . . One should not wait until the eye-teeth have come through and grown above the others but immediately take out one small molar on either side."

Similar opinions were expressed by Lecluse in 1754, Bourdet in 1757, Hunter in 1771, Duval in 1817, Robinson in 1846, and Chapin Harris in 1855.

In all cases, the manner of expression is as fascinating as the search for the proper method. Palsson includes a number of other writers whose directions were not as explicit. Now that the procedure has been established on a logical basis, the current responsibility is to stress the limitations as well as the possibilities of serial extraction. It is noteworthy that Delabarre issued a similar word of caution in 1819.

Much of this material can be found in Weinberger's *Orthodontics: An Historical Review of Its Origin and Evolution* (published in 1926 by The C. V. Mosby Company). Nevertheless, it remained for two contemporary authors, Kjellgren in Sweden and Hotz in Switzerland, to be the first to publish rational methods of serial extraction as it is practiced today; their report was published originally in their own languages, and later in English in the 1947-48 *Transactions of the European Orthodontic Society.*

B. F. Dewel.

Oral Cancer and Tumors of the Jaws. By George S. Sharp, M.S., F.A.C.R. (Ther.), Professor of Pathology, School of Dentistry, Assistant Clinical Professor of Surgery, School of Medicine, University of Southern California, Director, Pasadena Tumor Institute; Weldon K. Bullock, M.D., M.Sc. (Path.), Associate Clinical Professor of Pathology, School of Medicine, University of Southern California, Surgical Pathologist, Los Angeles County Hospital; and John W. Hazlet, D.D.S., Lecturer, Oral Tumor Pathology, School of Dentistry, University of Southern California. The Blakiston Division, McGraw-Hill Book Company, Inc., New York, Toronto, and London, 1956. 561 pages. Illustrated. Price, $15.00.

In the foreword to this text, Hayes Martin points out that in the control of cancer, "the initial patient-doctor contact and subsequent relationship still remains the cornerstone upon which a cure or palliation of a given case will largely depend." This being the case, it is of utmost importance for those concerned with the oral cavity to have adequate knowledge of the manifestation of this disease in the area in question.

The authors have provided a manual for the recognition of oral cancer. This should enable the dentist to make a differential diagnosis. A summarized account is presented of various disease entities, illustrated by photographs of roentgenograms and of the actual lesions as seen in the mouth.

The subject matter is divided as follows: Part One—Introductory Principles for Neoplastic Diseases; Part Two—Tumors, Benign and Malignant, of the Oral Mucosa and Accessory Cavities; Part Three—Neoplasms, Benign and Malignant, of the Jaws; Part Four—Quasi-tumors of the Jaws; and Part Five—Cysts of the Jaws.

Of special interest is Part Four which concerns itself with quasi-tumors of the jaws. Among these lesions and hyperplastic growths discussed are tori and exo- and enostoses. Described also are a series of odontogenic hamartomas. These are tumorlike malformations of dental origin and are presumed to develop from embryonic tissue left over from odontogenesis. Included among these formations are enamelomas, dentinomas, and odontomas. Many of these growths are frequently missed in the mouths of children. This book will not only be found useful by students and oral surgeons, but will instill a greater degree of awareness of oral cancer on the part of practicing dentists and orthodontists.

J. A. S.

News and Notes

Great Lakes Society of Orthodontists

The twenty-eighth annual meeting of the Great Lakes Society of Orthodontists will be held at the Hotel Statler, Detroit, Michigan, Oct. 20 through 23, 1957. Briefly, the program is as follows:

Essayists	*Title*
1. B. L. Herzberg	Matters Having to Do With the Tweed Teachings in Orthodontics.
2. B. L. Herzberg	The Treatment of Bi-Maxillary Protrusions According to Those Teachings.
3. Herbert Cooper	An Aid to Treatment Planning in Cleft Palate Cases.
4. Paul V. Reid	Extractions in the Borderline Case.
5. Byron Hughes	Dental Development and the Child as a Whole.
6. Paul V. Reid	Extractions in the Borderline Case: Case Reports.
7. William L. Wilson	The Use of Labial-Loop-Lingual Appliance in Different Types of Class II Cases.
8. William L. Wilson	The Use of Labial-Loop-Lingual Appliance in Deficiency Cases Where Extraction or Expansion Is Indicated.
9. M. C. Peterson	It's Later Than It Has Ever Been for Financial Security.

Orthodontists and students desiring to attend may make reservations directly through the Hotel Statler. Tickets for social functions may be procured from Dr. James Reynolds, Adrian, Michigan.

H. Irving Miller,
Program Chairman

Northeastern Society of Orthodontists

The annual meeting of the Northeastern Society of Orthodontists was held at the Hotel Commodore in New York City on March 3, 4, and 5, 1957.

About 400 members and guests registered for the three-day session, which commenced on Sunday night with a cocktail party and closed with table clinics on Tuesday afternoon. A program of seven papers by five clinicians and a Kodachrome movie film on the indirect band technique was presented, commencing Monday morning. Vice-President Walter Bedell officiated at the sessions because of the untimely death of President Oscar Jacobson.

The program follows:

The Integration of Periodontics in Orthodontic Therapy. D. Walter Cohen.

Labial-Loop-Lingual Therapy in Class III and Deficiency Cases. William L. Wilson.

Heredity, Growth, and Long-Term Dental Planning and Practice. Byron O. Hughes.

Orthodontic Efficiencies. Harold D. Kesling.

Changes and Variations in the Facial Skeleton During Growth. Harry Sicher.

Correction Direction. Francis J. Loughlin.

A Critical Analysis of Orthodontic Concepts and Objectives. William L. Wilson.

Periodontal Structures and Physiologic and Orthodontic Tooth Movement. Harry Sicher.

A proposed change in the Constitution and Bylaws received final approval. This creates an advisory group to the Executive Committee and will consist of the three immediate past-chairmen of former Executive Committees.

The following officers were elected:

President: Walter G. Bedell
Vice-President: Wilbur J. Prezzano
Secretary-Treasurer: David Mossberg
Editor and Sectional Editor: Joseph D. Eby
Assistant Editor: Brainerd F. Swain
Historian: Leuman M. Waugh
(For a term of two years)
Director to the A.A.O.: Norman L. Hillyer
Alternate Director: Richard A. Lowy.

The fall meeting of the Northeastern Society will be held at the Hotel Statler in Buffalo, New York, Oct. 21 and 22, 1957.

Pacific Coast Society of Orthodontists*

The Northern Component meets on the second Tuesday of March, June, September, and December.

The Central Component meets on the second Tuesday of March, June, September, and December.

The Southern Component meets on the second Friday of March, June, September, and December.

OFFICERS

President: A. Frank Heimlich, Santa Barbara, California
President-Elect: Richard M. Railsback, Oakland, California
Vice-President: Donald C. MacEwan, Seattle, Washington
Secretary-Treasurer: Raymond M. Curtner, San Francisco, California
Editor: Reuben Blake

OFFICERS OF COMPONENTS

Northern Component:
Chairman: James Keenan
Secretary-Treasurer: Kenneth Kahn

Central Component:
Chairman: Oliver E. Hartman
Secretary-Treasurer: Eugene E. West

*Notes from the *Bulletin* of the Pacific Coast Society of Orthodontists.

Southern Component:

Chairman: Roscoe Reedy
Secretary: Charles Linfesty
Treasurer: Burton Fletcher

The Pacific Coast Society of Orthodontists held its last meeting in Seattle, Washington.

Walter Reynolds Bedell, Poughkeepsie, New York, discussed "Active and Passive Treatment With Soft and Hard Tissue Borne Appliances Alone and in Conjunction With Various Dental Orthodontic Appliances."

Robert F. Hagerty, Charleston, South Carolina, discussed "The Development of Cleft Lip Repair and Its Orthodontic Significance."

Francis Calmes, Professor of Orthodontics, University of Kansas City (Missouri), and Victor Bowles, Associate Professor of Orthodontics, University of Kansas City (Missouri), discussed "Multiphase Philosophy and Technic."

Creation of a Special Committee (Committee to Study and Evaluate Orthodontic Educational Facilities and Courses).—The Board of Directors appointed the following committee: Chairman William A. Elsasser, Elwood B. Faxon, Howard M. Lang, and Arnold E. Stoller.

The purposes of the committee will be to make a study of present orthodontic courses and facilities within the area of the P.C.S.O., to evaluate their findings, and report to the Board of Directors. In addition, this committee has been asked to recommend ways and means of increasing orthodontic educational facilities within the area of the P.C.S.O. to meet the greatly increased demand for orthodontists and orthodontic training.

NORTHERN COMPONENT

The regular meeting was held at the Benjamin Franklin Hotel, Seattle, Washington, on Dec. 3, 1956.

The morning and early afternoon sessions were held jointly with the oral surgeons and pedodontists of this area for discussion of mutual problems. Three panels of six members, two from each group, presented their ideas on treatment procedures. Richard Philbrick and Wayne Bolton were co-chairmen.

CENTRAL COMPONENT

Our quarterly meeting and annual Christmas party was held at the Fraternity Club on Dec. 11, 1956. Eighty members were in attendance and thoroughly enjoyed the entire program.

The speaker for the occasion was Dr. Paul Lewis of Seattle, Washington, who discussed some of the problems encountered during the retention period and made some suggestions as to how they could be managed. Using slides and models, he described his labial buccal acrylic retainer, which he uses in conjunction with occipital anchorage. A discussion of its application and uses was continued from the afternoon session after we had had our annual visit from Santa Claus in the evening.

SOUTHERN COMPONENT

The Dec. 14, 1956, meeting was called to order by Chairman Cal Garverick at 3:00 P.M.

Bob Gawley introduced the speaker of the afternoon, Dr. Robert E. Moyers, Professor and Head of the Orthodontic Department, University of Michigan. His subject—"The Physiology of Centric and Other Jaw Relations, With Particular Reference to the Finishing Stages of Orthodontic Treatment"—proved to be interesting and informative to the large attendance.

Cliff Willcox introduced Dr. Charles Sweet, Professor of Pedodontics, University of Southern California, who discussed the activities of the Pedodontic Department and briefly outlined the plans for the new building.

Sydney Cross, of the Southern Component, was asked by the Board of Directors to investigate the following and submits this report:

This is a report from the Insurance Counsellor of the Southern California State Dental Association, concerning the possibility of liability being incurred by a dentist engaged in the practice of orthodontics in two specific cases, in both of which the patient would be a minor.

In the first instance the patient is to be inducted into military service and is therefore required to have all orthodontic appliances removed. He has made this request personally and orally. The question arising here is whether the orthodontist is likely to incur any liability for removing the appliances, or for leaving them in should the patient or parents of the patient refuse to give permission for their removal. It was the opinion of the attorney for the insurance counsellor that not only should there be consent from the parents, but also a written request or direction to remove the appliances. If they do not comply with this request, the orthodontist should refuse to remove them, and the responsibility for doing so would rest with the dental officer of the Army or Navy.

If the patient in question leaves the office with the appliances in the mouth after the aforementioned procedure has been followed and does not return within a reasonable period of time (about one month), a registered letter should be sent to the parents by the orthodontist notifying them of the harmful results which will follow if the appliances remain in place without supervision, and pointing out that it is essential that the treatment be continued or the appliances removed. Failure to receive an answer to this letter absolves the orthodontist of all liability and responsibility pertaining to the patient in question. If the parents have refused to sign consent, a notation to that effect should be made on the record card. It was also the opinion of the attorney that the minor's consent should be obtained since, without this, he may sue upon attaining his majority. This signature, even though that of a minor, would be a potent weapon in the orthodontist's defense, should such a lawsuit eventually materialize.

The attorney calls attention to the fact that a minor generally is any male or female under the age of 21, the exception being that married males and females over the age of 18 are legally considered adults. It is important to note that this is the law as it applies in the State of California, since most states do not recognize married males as adults until they reach the age of 21.

The second situation pertains to nonpayment of fees by the parents, in the case of a minor, or by the patient in the case of an adult. In this instance it is the opinion of the attorney that reasonable notice must be given of the orthodontist's intention to discontinue treatment and withdraw from the case, unless payment is brought up to date. This period of time is an arbitrary one; however, the attorney considers one month's notice as being ample. Under these circumstances he asserts that there would be little likelihood, if any, of the orthodontist incurring liability for the removal of appliances because of nonpayment of fees.

Southwestern Society of Orthodontists

The thirty-seventh meeting of the Southwestern Society of Orthodontists will be held in the Statler-Hilton Hotel, Dallas, Texas, Sept. 28 through Oct. 2, 1957. Dr. Tom M. Williams of Dallas will preside.

American Dental Association

The ninety-eighth annual session of the American Dental Association will be held in Miami-Miami Beach, Florida, Nov. 4 to 7, 1957.

New Postdoctoral Dental Program at Harvard University

Starting in September, 1957, Harvard University will launch a new program in dental medicine intended to prepare young dental graduates for careers in academic dentistry.

The five-year postdoctoral study program, made possible through a grant of $162,000.00 from the United States Public Health Service, will be carried on within the Harvard School of Dental Medicine.

Dr. Roy O. Greep, Dean of the School of Dental Medicine, in announcing receipt of the grant, said: "The program is designed to enable young dental graduates to broaden their professional experience by developing competence in research, gaining teaching experience, and increasing their proficiency in the care of patients."

"Harvard is offering the program at this time," Dr. Greep said, "because at no time during the last hundred years of educational progress and public service has American dentistry been the center of greater and more hopeful national and international attention."

Never before, he pointed out, has there been on the national scene a greater awareness of the magnitude of dental health problems and the need for their solution through dental research and preventive dentistry.

"In other parts of the world," he stressed, "where restorative dentistry is less readily available, attention is focused on recent American contributions to dental science and prevention with the expectation of continuing leadership."

"Tooth decay," Dr. Greep said, "is initiated in a unique biological structure which is devoid of cells, nerves, and blood vessels and whose dynamic and metabolic relationship to the rest of the organism is only imperfectly understood. The vast body of modern-day knowledge available in other areas of biology and medicine is not immediately applicable to the understanding of the most prevalent of all dental diseases.

"It is imperative, therefore," he declared, "for dentistry to equip itself to develop the broadly trained individuals competent to work effectively in this important area."

Dr. Greep pointed out, however, that although there has been a significant growth in opportunities for participation in dental research and advanced dental education programs (dental internships, postgraduate courses in the dental specialities, etc.) none has provided an opportunity for young dentists to embrace the total content of academic dentistry—patient care, teaching, and research.

"Such a threefold opportunity is embodied within the postdoctoral program in the Harvard School of Dental Medicine," he said.

Dr. Greep also called attention to the fact that Harvard University, for the past ten years, has supported in the School of Dental Medicine a revolutionary new program of undergraduate dental education embracing both the clinical and the basic sciences and related to a well-balanced program of dental research.

The new postdoctoral dental medicine program will be under the immediate direction of Dr. Reidar F. Sognnaes, Associate Dean of the School, and will be carried on in collaboration with the basic science department of the Harvard Medical School and the affiliated clinics at the Forsyth Dental Infirmary for Children, Children's Hospital, and the Massachusetts General Hospital.

Among those concerned with the direction of portions of the postdoctoral program will be Dr. David Weisberger, Professor of Dental Medicine and Chief of the Dental Service, the Massachusetts General Hospital; Dr. Paul Losch, Associate Professor of Pediatric Dentistry and Chief of Dental Service, Children's Hospital; Dr. John B. Macdonald and Dr. Conrad Moorrees, Director and Chief of Orthodontics, respectively, at the Forsyth Infirmary.

Three postdoctoral students will be admitted to the program in the first year, with three additional students added each year for the first three years. For the present, Dr. Greep noted, the program would be limited to a total of nine students.

Those accepted for postdoctoral training must be graduates of an accredited dental school with high scholastic standing; they will be selected on the basis of interest, accomplishments, and recommendations.

American Thrift Assembly

Seven national associations have opened a single headquarters in Washington, D. C., to encourage through appropriate legislation the establishment of voluntary pension plans by self-employed citizens.

Incorporated as "American Thrift Assembly for Ten Million Self-Employed," the operation is spearheaded by the American Bar Association, the American Institute of Accountants, the American Retail Federation, the National Association of Real Estate Boards, the American Medical Association, the American Dental Association, and the National Association of Retail Druggists.

These seven have formed a steering committee to present the viewpoint of some twenty national associations comprising members in business, argriculture, and the professions.

F. Joseph Donohue, Washington attorney, is national chairman.

"American Thrift Assembly is seeking for the self-employed tax deferment on a limited amount of annual personal income when it is set up as retirement savings," Donohue said.

He pointed out that bills to enable the self-employed to set up voluntary pension plans have been introduced in both houses of Congress.

"The self-employed," he asserted, "believe these bills will promote long-term savings . . . restore the virtue of thrift, the fundamental factor in combatting inflation.

"Such legislation would also, in some measure, offset the dwindling rewards of self-reliance—a once-cherished goal in America that seems to be succumbing in the cross-fire of steeply-graduated taxes and cheapening dollars."

He added: "Professional men, especially, claim to see a trend away from the risks of self-employment, especially by younger men just entering the business or professional world. They know that under present federal tax laws many employed individuals enjoy a distinct security advantage over persons who are self-employed . . . in terms of health insurance and retirement benefits."

Donohue disclosed that local "thrift assemblies" are being formed "all over the country" to encourage farmers, small businessmen, and professional citizens "to understand and come to grips with their old-age retirement problems."

U. S. Department of Health, Education, and Welfare

Marion B. Folsom, Secretary of Health, Education, and Welfare, recently issued the following statement in connection with the President's nomination of Katherine Brownell

Oettinger as Chief of the Children's Bureau: "Dean Oettinger has demonstrated outstanding qualities of leadership in the field of child health and child and family welfare. She will bring to the Children's Bureau an inquiring mind, an interest in research, extensive experience in the important field of mental health, and outstanding administrative abilities."

American Association for Cleft Palate Rehabilitation

The fifteenth annual meeting of the American Association for Cleft Palate Rehabilitation will be held at the Hotel Clevelander in Cleveland, Ohio, on May 2, 3, and 4, 1957. Thursday, May 2, will be devoted to a full-day course on "Velopharyngeal Sphincter Incompetency." The following two days will be devoted to paper presentations concerned with the many aspects of cleft palate rehabilitation.

American Dental Association

The fourth quarter of the *Index to Dental Literature,* containing a cumulative index to all dental books and articles which have appeared in English-language dental periodicals in the United States and foreign countries, is now available. The *Index* is prepared by the Association's Bureau of Library and Indexing Service.

Listed in the final quarter of the *Index* are 5,669 items found in 799 separate issues of dental publications. This includes original articles, editorials, reprints, abstracts, and extensive obituary coverage, all alphabetically arranged according to author and subject entry.

The *Index* provides a quick means for locating all articles on a particular subject.

The yearly subscription rate for the year's quarterly cumulated issues is $20.00. The annual cumulated volume costs $10.00. Orders should be sent to the A. D. A. Subscription Department, 222 E. Superior St., Chicago 11, Illinois.

B. E. Lischer Honored by Washington University

Benno Edward Lischer, pioneer orthodontist and dean emeritus of the Washington University School of Dentistry, was one of seven faculty members honored for outstanding achievement and service at the University's annual Founders' Day observance on Feb. 20, 1957.

Dr. Lischer, who retired as dean of the School of Dentistry in 1945, has written three textbooks and is a frequent contributor to professional publications. He received the Albert H. Ketcham Memorial Award in 1951.

Dr. Lischer has served as president of the American Association of Orthodontists and the American Association of Dental Schools. He is a fellow of the American Association for the Advancement of Science. He is also a member of the International Association for Dental Research and the American Medical Association.

European Orthodontic Society

The next meeting of the European Orthodontic Society will take place Aug. 29 to Sept. 2, 1957, in Stockholm, Sweden. Interesting papers have already been announced by orthodontists from the United States, Israel, and all countries of Europe. Simultaneous translation will make comprehension of all conferences easy.

All inquiries may be addressed to the president of the European Orthodontic Society: Professeur E. Fernex, 1 place du Port, Geneve, Suisse.

Fédération Dentaire Internationale
Twelfth International Dental Congress

The Twelfth International Dental Congress will be held at the Congress building of the E. U. R. in Rome, Italy, Sept. 7 to 14, 1957.

The scientific program consists of twenty-five reports and 150 co-reports covering all fields of dentistry, including anatomy and physiology, anesthesia and surgery, caries and protective therapy, periodontal diseases, radiology, prosthesis, dento-maxillo orthopedics, and social dentistry. Before Sept. 7, 1957, all reports will be published in English, with a summary in French, German, Italian, and Spanish, in the *International Dental Journal* and in Italian in the *Rivista Italiana di Stomatologia.* In their September and October issues both journals have already published the reports of J. P. Walsh (Otago, New Zealand), J. G. de Boer (Groningen, Netherlands), J. A. Salzmann (New York), C. G. Paffenbarger (Washington), H. H. Stones and F. A. Lawton (Liverpool), and E. Müller (Hamburg, Germany).

By means of simultaneous translations, Congress members will be enabled to hear the reports, co-reports, and discussions in the five official languages—English, French, German, Italian, and Spanish.

The Responsibilities of the Medical Profession in the Use of X-rays and Other Ionizing Radiation

Statement by the United Nations Scientific Committee on the Effects of Atomic Radiation

1. The United Nations General Assembly, being aware of the problems in public health that are created by the development of atomic energy, established a Scientific Committee on the Effects of Atomic Radiation. This Committee has considered that one of its most urgent tasks was to collect as much information as possible on the amount of radiation to which man is exposed today and on the effects of this radiation. Since it has become evident that radiation due to diagnostic radiology and to radiotherapy constitutes a substantial proportion of the total radiation received by the human race, the Committee considers it desirable to draw attention to information that has been obtained on this subject.

2. Modern medicine has contributed to the control of many diseases and has substantially prolonged the span of human life. These results have depended in part on the use of radiation in the detection, diagnosis, and treatment of disease. There are, however, few examples of scientific progress that are not attended by some disadvantages, however slight. It is desirable, therefore, to review objectively the possible present or future consequences of increased irradiation of populations which result from these medical applications of radiation.

3. It is now accepted that the irradiation of human beings, and particularly of their germinal tissues, has certain undesirable effects. While many of the somatic effects of radiation may be reversible, germinal irradiation normally has an irreversible and therefore cumulative effect. Any irradiation of the germinal tissues, however slight, thus involves genetic damage which may be small but which is, nevertheless, real. For somatic effects there, however, may be thresholds for any irreversible effects, although, if so, these thresholds may well be low.

4. The information so far available indicates that the human race is subjected to natural radiation,* as well as to artificial radiation due to its medical applications, to atomic industry and its effluents, and to the radioactive fall-out from nuclear explosions. The Committee is aware of the potential hazards that such radiation involves, and it is collecting and examining information on these subjects.

5. The amount of radiation received by the population for medical purposes is now, in certain countries, the main source of artificial radiation and is probably about equal to that from all natural sources. Moreover, since it is given on medical advice, the medical profession exercises responsibility in its use.

6. The Committee appreciates fully the importance and value of the correct medical use of radiation in the diagnosis of a large number of conditions, in the treatment of many such diseases as cancer, in the early mass detection of conditions such as pulmonary tuberculosis, and in the extension of medical knowledge.

7. Moreover, it appreciates fully the contribution of the radiological profession, through the International Commission on Radiological Protection,† in recommending maximum permissible levels of irradiation. As regards those whose occupation exposes them to radiation, the establishment of these levels depends on the view that there are doses which, according to present knowledge, do not cause any appreciable body injury in the irradiated individual, and also on the consideration that the number of people concerned is sufficiently small for the genetic repercussions upon the population as a whole to be slight. Whenever exposure of the whole population is involved, however, it is considered prudent to limit the dose of radiation received by germinal tissue from all artificial sources to an amount of the order of that received from the natural background radiation.

8. It appears most important, therefore, that medical irradiations of any form should be restricted to those which are of value and importance, either in investigation or in treatment, so that the irradiation of the population may be minimized without any impairment of the efficient medical use of radiation.

9. The Committee is consequently anxious to receive information through appropriate governmental channels as to the methods and the extent by which such economy in the medical use of radiation can be achieved, both by avoiding examinations which are not clearly indicated and by decreasing the exposure to radiation during examinations, particularly if the gonads, or the fetus during pregnancy, lie in the direct beam of radiation. It seeks, in particular, to obtain information as to the reduction in radiation of the population which might be achieved by improvements in instrument design, by fuller training of personnel, by local shielding of the gonads, by choosing appropriately between radiography and fluoroscopy, and by better administrative arrangements to avoid any unnecessary repetition of identical examinations.

10. The Committee also seeks the cooperation of the medical profession to make possible an estimate of the total radiation received by the germinal tissue of the popula-

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*The radiation due to natural sources has been estimated to cause between 70 and 170 millirem of irradiation to the gonads per annum in most parts of certain countries in which it has been studied, although higher values are found locally in some areas. (See the reports, "The Hazards to Man of Nuclear and Allied Radiations," published by the United Kingdom Medical Research Council in June, 1956, in which also the millirem is defined; and from information submitted to the Committee.)

†See the report of the International Commission on Radiological Protection (published in the *British Journal of Radiology*, Supp. 6, December, 1954, in the *Journal français d'electroradiologie*, No. 10, October, 1955, etc., and revised in 1956).

tion before and during the child bearing age. It considers it to be essential that standardized methods of measurement, of types at present available, should be widely used to obtain this information and it emphasizes the value of adequate records, maintained by those using radiation medically, by the dental profession, and by the responsible organizations in allowing such radiation exposure to be evaluated. The Committee is convinced that information of this type will make it possible to decrease the total medical irradiation of the population while preserving and increasing the true value of the medical uses of radiation.

The Jenkins-Keogh Bill

The Jenkins-Keogh Bill (H.R. 9 and 10 Bills introduced in Congress) has been of so much interest to the readers of the AMERICAN JOURNAL OF ORTHODONTICS that it is thought advisable to publish the latest up-to-date information on this subject.

Representative Keogh advises us that the bills are still pending before the House Committee on Ways and Means, and that every effort is being made to obtain their enactment.

An analysis of these two bills follows herewith:

ANALYSIS OF H.R. 9 AND 10, THE SO-CALLED JENKINS-KEOGH BILL

General Statement

The purpose of the bill is to encourage the establishment of voluntary pension plans by self-employed persons. This would be accomplished by affording such persons a tax deferment on a limited portion of their income set aside for their retirement. Under existing law such tax deferment is afforded to employed persons whose employers have established so-called employee pension plans meeting certain statutory requirements. However, since self-employed persons cannot be their own employees, they cannot qualify under existing legislation.

It will be recalled that the Social Security Act, which sets up a compulsory system of old-age pensions, originally only applied to employed persons, but was later extended to most self-employed persons. H.R. 9 and 10 would give self-employed persons a measure of equality with employed persons so far as supplemental private pensions are concerned.

Summary of Bill

Generally speaking, the bill would allow self-employed persons a deduction for Federal income tax purposes for amounts set aside for their retirement, with a proviso that the annual deduction could not exceed the lesser of 10 per cent of self-employment income or $5,000.00 However, a special rule would be provided in the case of persons now 50 years of age or over, who would have only a few years in which to build up a retirement fund. In their case the allowable deduction would be increased one-tenth for each year of age over 50 and not over 70. To the extent that allowable deductions were not used in any year they would serve to increase the allowable deduction during the following five years until exhausted, except that a maximum annual ceiling of $5,000.00 would still apply. A self-employed person could not deduct over his lifetime more than twenty times the maximum annual contribution under the general rule.

The definition of a self-employed person is the same as under the self-employment provisions of the Social Security Act, except that it also includes those not presently covered under such provisions, such as physicians, ministers, etc. Self-employed persons who also are employed during the year are not disqualified unless they are currently members of, or are receiving payments under, a governmental or private pension or profit-sharing plan, or have received a distribution of their interest in such a pension or profit-sharing plan.

The allowable deduction is in terms of amounts paid as so-called "retirement deposits," which are defined as amounts paid into a restricted retirement fund or as premiums under a restricted retirement policy.

A "restricted retirement fund" is defined as a trust or custodian account established under a retirement plan for self-employed persons. Funds held in a restricted retirement fund could be invested only in Federal, state, and municipal securities, corporate stock or securities listed on a recognized exchange (other than stock or securities in a corporation in which a member of the plan owns more than 10 per cent of the voting stock), and stock in a so-called "regulated investment company" meeting the requirements of Section 851 of the Internal Revenue Code. Earnings realized by a restricted retirement fund would not be taxable until distributed to the participants.

"Restricted retirement policies" would include life insurance or annuity contracts except term insurance, but in the case of life insurance policies no deduction would be allowed for the portion of the premium attributable to the cost of life insurance protection. Restricted retirement policies would include newly issued annuity, endowment, and life insurance contracts and existing policies, except that in order to use existing policies as a funding medium the insurance company would first have to be notified of the taxpayer's intention and make the necessary endorsement on the policy.

The bill contemplates generally that retirement funds will not be payable until age 65. They would be subject to income tax in the hands of the participants at the time distributed. Lump-sum distributions after age 65 would be taxed under a special formula to avoid having the retirement funds largely dissipated by being taxed in one year under the higher surtax brackets. In lieu of the rates otherwise applicable, the lump-sum distribution would be assessed at five times the rate applicable to one-fifth of the amount. The same treatment would be given payments on the death of the participant.

Withdrawal of the retirement fund prior to age 65 is permitted, subject to the payment of a penalty. In such case, it is provided that the tax shall be 110 per cent of the amount which would have been payable had the distribution been included in the individual's gross income ratably over the taxable year and the four taxable years immediately preceding (or such lesser number of immediately preceding taxable years in which retirement deposits were made).

The foregoing tax provisions would apply equally to distributions from a restricted retirement fund and under a restricted retirement policy.

University of Alabama

The University of Alabama School of Dentistry announces the following refresher courses:

June 3-7, 1957. Surgical Anatomy of Head and Neck and Etiology and Diagnosis of Pain of Dental Origin. Harry Sicher, Chicago, Illinois.

June 15-17, 1957. Preventive Orthodontics. Earl E. Shepard, St. Louis, Missouri.

Notes of Interest

J. Frederick Conrad, D.D.S., is pleased to announce the association of Maurice E. Masters, D.D.S., in the practice of orthodontics, Allen-Williams Dental Group, 1963 Fourth Ave., San Diego, California.

Frank P. Gilley, D.D.S., M.S.D., announces the removal of his office to 135 Broadway, Bangor, Maine, practice limited to orthodontics.

Dr. Louis P. Greenberg announces the opening of his office at 3600 West Rogers Ave., Corner Park Heights, Baltimore, Maryland, practice limited to orthodontics.

Dr. E. E. Johns wishes to annouce the removal of his office from 221 King St. E., Kingston, Ontario, to his new location at 847 Princess St. Dr. D. P. Hult is no longer associated with Dr. Johns.

Anthony G. Miller, Jr., D.D.S., announces his return from military service with the United States Air Force and the resumption of his practice, limited to orthodontics, at 4709 Montgomery Lane, Bethesda, Maryland.

H. Carlyle Pollock, Jr., D.D.S., orthodontist, announces the removal of his office to Belcaro Medical Bldg., 915 S. Colorado Blvd., Denver, Colorado.

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The AMERICAN JOURNAL OF ORTHODONTICS is the official publication of the American Association of Orthodontists and the following component societies. The editorial board of the AMERICAN JOURNAL OF ORTHODONTICS is composed of a representative of each one of the component societies of the American Association of Orthodontists.

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Forthcoming meetings of the American Association of Orthodontists:
1957—Roosevelt Hotel, New Orleans, Louisiana, May 12 to 16.
1958—Commodore Hotel, New York, New York, April 27 to May 1.
1959—Statler Hotel, Detroit, Michigan, May 4 to 7.

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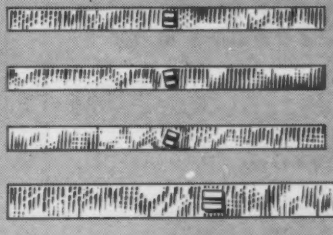

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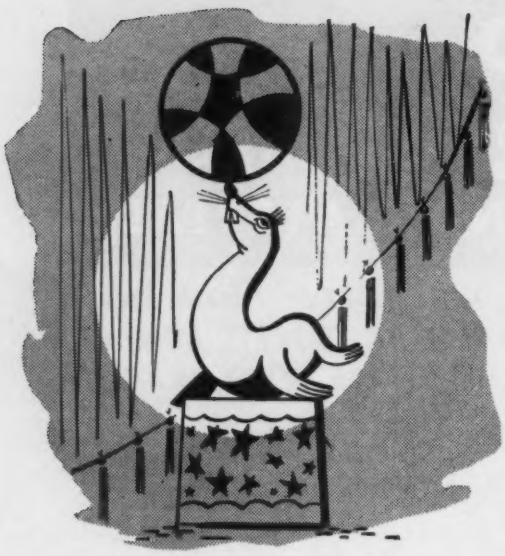

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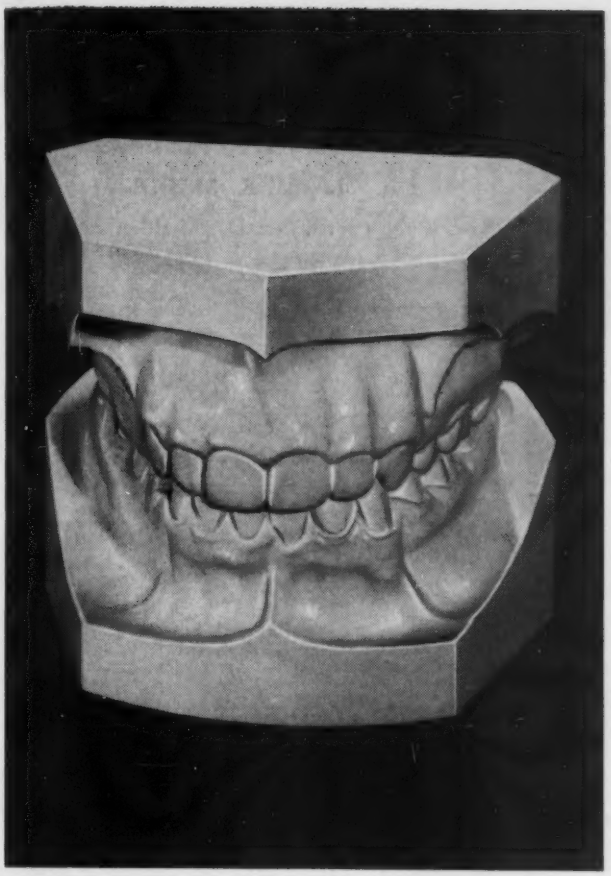

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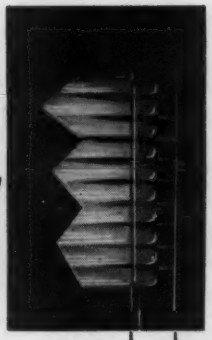

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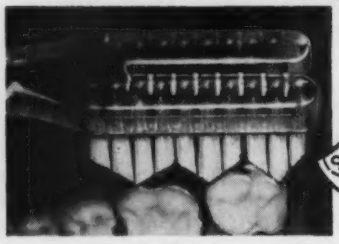

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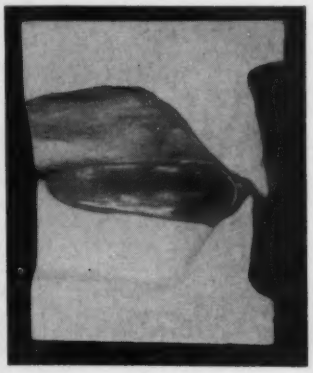

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